

# Railway Engineering and Maintenance



*Outstanding  
Like the  
Sun*

THE IMPROVED FAIR-RAIL ANCHOR

CHICAGO • NEW YORK • DENVER  
WASHINGTON • ST. LOUIS

**THE P. & M. CO.**

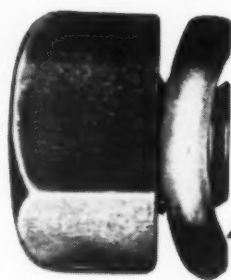
CLEVELAND • ST. PAUL  
BOSTON • SAN FRANCISCO

Reliance **HY-CROME** Spring Washers

# THE HY-CROME FAMILY



**LOCOMOTIVE  
HY-CROME**



**HY-CROME  
SPRINGLOX**

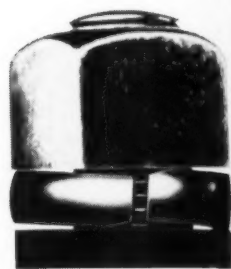


**HY-PRESSURE  
HY-CROME**



**HY-CROME  
PRESSURE SPRING**  
20,000 LBS. TO COMPRESS  
1" BOLT

Hy-Crome Spring Washers provide an efficient, economical, and automatic method of guaranteeing adequate bolt tension in spite of wear and bolt elongation. A type of Hy-Crome has been designed for each specific application.



**HY-CROME  
PRESSURE SPRING**  
6,500 LBS. TO A.R.E.A. STRESS  
1" BOLT

**MEMBER**



The opportunity to greet many of our railroads' friends at the Roadmasters Convention, as has been our custom, will be very much missed this year. We wish, therefore, in this way to extend our congratulations on the handling of a tremendous and difficult war transportation job. The urgent necessity for regular and uninterrupted passenger and freight service has been keenly realized, and the meeting of this war obligation with reduction in personnel and maintenance materials has been a noticeable accomplishment. Industrial plants have been awarded the Army-Navy "E" for such service. The American Railroads certainly are entitled to national recognition for their outstanding war service and our praise is high and our hats are off to those men who have made the achievement of these objectives possible.



**DOUBLE HY-CROME**

**STANDARD HY-CROME**

**RIB HY-CROME**

**FROG & CROSSING HY-CROME**

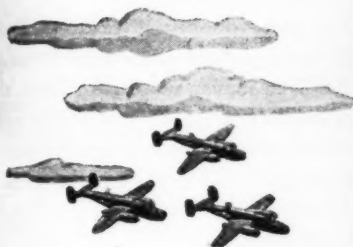
**HY-REACTION HY-CROME**

**THACKERAY HY-CROME**

**EATON MANUFACTURING COMPANY**  
**RELIANCE DIVISION**  
**MASSILLON, OHIO**

Sales Offices: New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Montreal





**GROWING INTO ITS**

*Wings*



This is part of a bird that is hatched in sections, bit by bit, piece by piece. Shown here is the center and nose of a medium bomber, ready for shipment by rail. At another point of assembly, other parts of the body will "grow" into place. Soon the half-bird you see will be a full-fledged eagle over Europe.

Hauling parts and sub-assemblies for weapons of war is one of the major tasks that American railroads are now performing. It is a job that requires ingenious

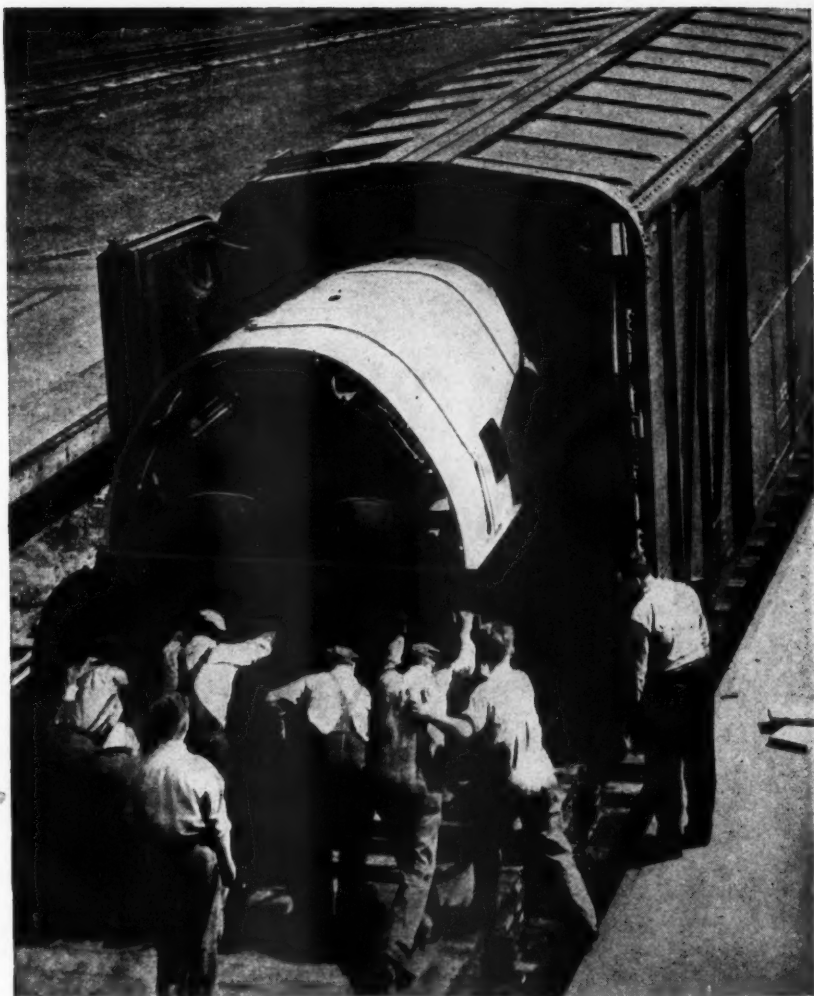
methods, expert handling, and practiced skill . . . and that calls for the utmost in dependable rolling stock and track equipment.

In supplying wheels and axles, boiler and firebox plates, freight cars, rails, track specialties, and many other items, Bethlehem is helping the railroads of America to meet their unprecedented wartime responsibilities; helping them deliver, efficiently and on time, the greatest loads in transportation history.



ALLOY STEELS . . . BOILER AND FIREBOX PLATES . . . BRIDGES . . . FREIGHT CARS . . . FORGINGS . . . MAYARI R (high-strength, low-alloy steel) . . . RAILS  
SPIKES . . . SWITCH STANDS . . . TOOL STEELS . . . TRACK BOLTS . . . TRANSMISSION-LINE TOWERS . . . TUBULAR PRODUCTS . . . WHEELS AND AXLES

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**"MULTI PLATE**  
is the only  
practicable structure  
that can be used"

That's what a main-line railroad official said about ARMCO Multi Plate needed to replace a structure that had failed by undercutting.

It's easy to see why engineering and maintenance men rely on Multi Plate to overcome severe service conditions. It is easily installed and you can reline or replace an average small bridge in a few days without interrupting traffic.

The rugged Multi Plate sections can be assembled by your regular crew without special equipment, and in any weather. Once the job is completed with backfill and headwall, you have a bridge strong enough to withstand any railroad loading condition.

Not every order for Multi Plate can be filled. The steel may be needed more urgently somewhere else. Even so, you will want to have all the facts on ARMCO Multi Plate Pipe and Arches when you start restoring war-weary roadbeds to peak efficiency. Write to Armco Railroad Sales Co. Incorporated, 651 Curtis Street, Middletown, Ohio.

EXPORT: THE ARMCO INTERNATIONAL CORPORATION



**ARMCO MULTI PLATE Pipe and Arches**



Fewer Hands Can Pull More Spikes with

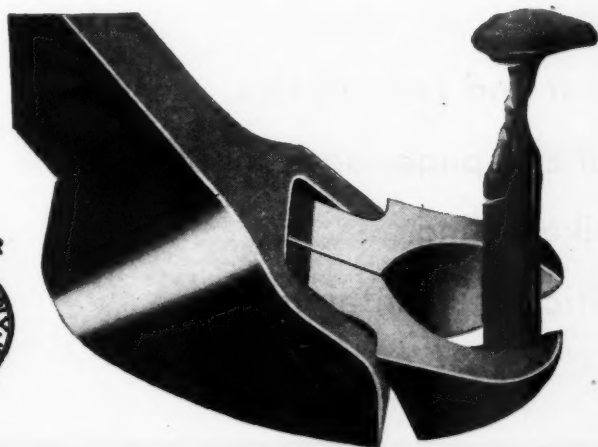
# Flex-Toe Claw Bars

With Flex-Toe Claw Bars, two men can pull as many spikes as three men can pull with ordinary bars. Not only spikes but drift bolts and bolt spikes come out easier and faster with Flex-Toe, even when located in such difficult places as rail-joints.

Our deliveries during the war have been much slower than normal times. Now with war production slacking off, we are happy to say to you . . .

"Prompt delivery on Flex-Toe Claw Bars."

*. . . Place Your Order Today*



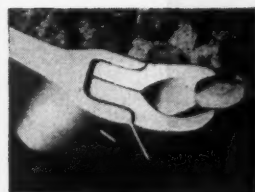
MEMBER



Throw the bar on the spike in the usual way. No driving necessary.



Tips of the toes grab hold automatically as leverage is applied to the handle.



Flex-Toe holds onto the body of the spike and removes the spike **WITHOUT SPIKE MAUL DRIVING.**



Remove spikes straight out by taking a series of holds along the body of the spike—a ratchet action.

**"WARREN-TEED"**



**WARREN TOOL CORP. • WARREN, OHIO**



# *Elastic* **RAIL SPIKES**

**FOR POST WAR IMPROVEMENTS**

Safer high speed track.

Less wear and tear on ties.

Less rail creepage—both directions.

Less spike killing.

Less difficulty maintaining gage.

MEMBER



## **ELASTIC RAIL SPIKE CORPORATION**

Affiliate of Bernuth, Lembcke Co., Inc.

420 LEXINGTON AVENUE

NEW YORK, N. Y.

Houston

»

Pittsburgh

»

London



# *A New Line of Forged Adjustable Rail Braces*

PRESENTED BY

## **PETTIBONE MULLIKEN CORPORATION**

... THE RESULT OF SUGGESTIONS FROM RAILROAD MAINTENANCE  
OF WAY AND SIGNAL DEPARTMENTS

### *Maximum Bracing—Minimum Maintenance—Longer Service Life*

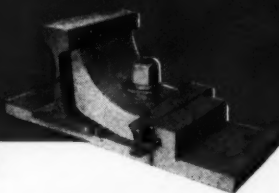
PETTIBONE MULLIKEN design (1) Reduces the need for full rigid clamping. (2) Supplies constant bracing to the rail whether bolts are tight or loose or whether no bolts are used. (3) Controlled flexibility—not attempting to stop the wave or up-and-down motion of the rail, yet

restricting tipping or side-thrust—no wide gage—close signal adjustments. (4) Provides larger, better fitting wearing areas, of forged, copper bearing corrosion resistant steel, thus reducing the frequency of adjustment. (5) Makes infrequent adjustment easy.



**Two Bolt Brace**

Bolts will be initially tighter and will stay tight longer than on other bolted braces. Maintains gage and is an effective brace to the rail even if bolts work loose. Square-head acorn nuts spaced for 180° turn with ordinary track wrench. 11 pieces—easy to install, adjust or remove.



**One Bolt Brace**

Bolt will be initially tighter than on other braces. Single bolt acts as a pivot under rocking motion caused by change of wheel weight from receiving to leaving edges of plate—tends to remain tight longer. Maintains gage and is an effective brace to rail even if bolt works loose. Square head acorn nut permits 180° turn with ordinary track wrench. 8 pieces—easy to install, adjust or remove.



**Boltless Brace**

No bolts to corrode, wear or tighten. Controlled flexibility—up and down or wave motion of rail is not limited, yet restricts its tipping or side-thrust. Maintains gage, and permits accurate signal adjustments. Simplicity assures proper maintenance. Design permits single or double spiking on outside of stock rail if desired. 4 pieces—wedge, brace, key and plate.



**Curve Brace**

Boltless brace designed for use on curves in conjunction with gage rods—yet can be used at guard rails and switches. Supports head of rail against side-thrust or tipping forces. Easily installed, adjusted or removed. Maximum flexibility. Design permits single or double spiking on both sides of rail. Simplicity assures proper maintenance. Insulated brace member optional. 4 pieces—wedge, brace, key and plate.

**Write for Bulletin No. 1101**

Established 1880

# **PETTIBONE MULLIKEN CORPORATION**

4710 West Division Street, Chicago 51, Illinois

# Get **MOSS**

## For Your Money

Thirty-five railroads are now using **MOSS READY-MADE SECTIONAL HIGHWAY CROSSINGS**. Many of them feel they are getting "most for their money" with these crossings. Among many reasons for this—**MOSS CROSSINGS** are easy to install, require a minimum of labor, and are highly resistant to abrasion and wear.

Made to order and shipped ready to install, **MOSS READY-MADE CROSSINGS** need no adzing or fitting. A small track gang with their regular tools can easily and quickly install them, thus cutting down installation costs.

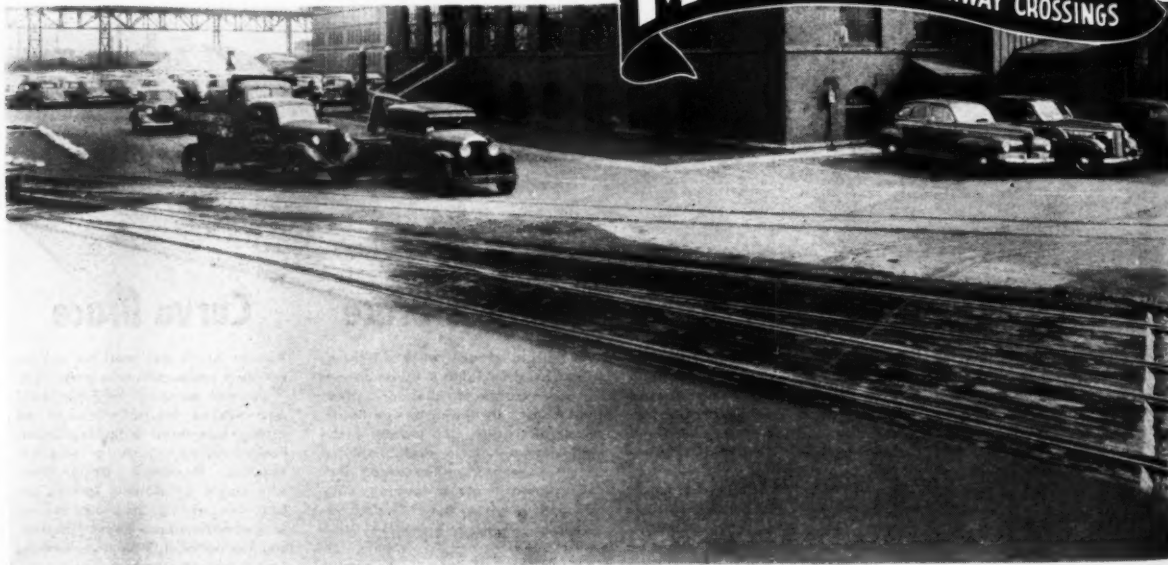
Made of creosoted Black Gum timbers, **MOSS CROSSINGS** are built for heavy duty. These crossings now have a record of thirteen years' service without maintenance expense in some of

the heaviest truck traffic in the country. Inspection at this time finds these crossings in such fine condition that it is not unreasonable to anticipate at least double this service life (twenty-five to thirty years).

Lightweight **MOSS CROSSINGS** can easily be removed and re-installed if track work is ever necessary. And, there is no need to detour traffic.

**FOR YEARS OF SATISFACTORY  
SERVICE INSTALL**

**MOSS** READY-MADE  
SECTIONAL  
HIGHWAY CROSSINGS



Plan your 1945 program now for Spring and Summer deliveries. Write for descriptive circular.

### T. J. MOSS TIE COMPANY

SECURITY  
BUILDING

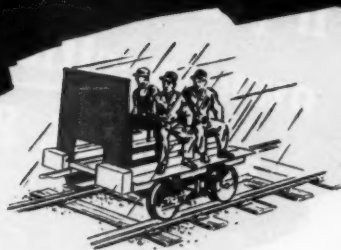
*The Stamp of Character*

FOUNDED 1879

**MC**

ST. LOUIS  
MISSOURI

# Motor Cars That Meet the Emergency



Fairbanks-Morse Motor Cars meet railroad wartime emergency needs for cars that stand up—that can take it 24 hours a day—in all kinds of weather—and under all conditions.

They are sturdy—reliable—powerful—safe motor cars that are backed by years of railroad experience in motor car design and construction.

The complete line of Fairbanks-Morse-built

Sheffield Motor Cars includes sizes ranging from one-man cars up to heavy-duty motor cars. Bulletins and complete information supplied upon request.

Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.

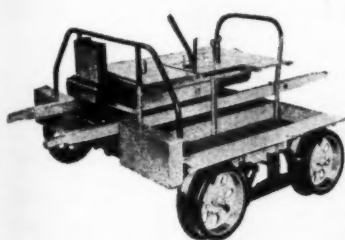


**SHEFFIELD MODEL 44-B**—The standard section car on many railroads. Sturdy, roomy. Weighs 1095 pounds. Has ample power to haul trailers loaded with men, tools or ties. Water-cooled 8- to 13-hp. engine with air-cooled head. Chain drive.

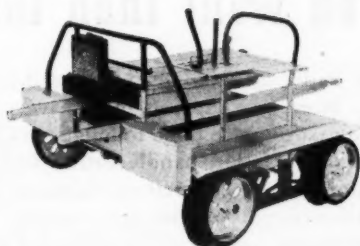
**First  
on the  
Rails...  
and Still  
First**



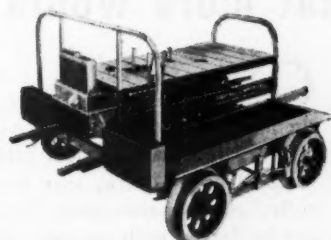
**SHEFFIELD MODEL 40-B**—One of the finest heavy-duty motor cars on rails. Has powerful engine—weighs 1235 pounds—ample room for section gangs. Has four speeds forward and reverse, with more than enough power to haul trailers.



**NEW FAIRBANKS-MORSE VICTORY MODEL 57**—The one-man inspection car, easily handled by one man alone. Has dependable 9-hp., water-cooled engine. Equipped with clutch and roller chain transmission.



**NEW FAIRBANKS-MORSE VICTORY MODEL 757**—Inspection car is similar to Model 57, but belt-driven.



**SHEFFIELD MODEL 54-B**—Inspection car for 1 to 4 men. Has 5- to 8-hp., water-cooled engine—self-centering, powerful brakes, wood center wheels—adjustable rear axle box—and is chain-driven. Model 754-B is belt-driven.



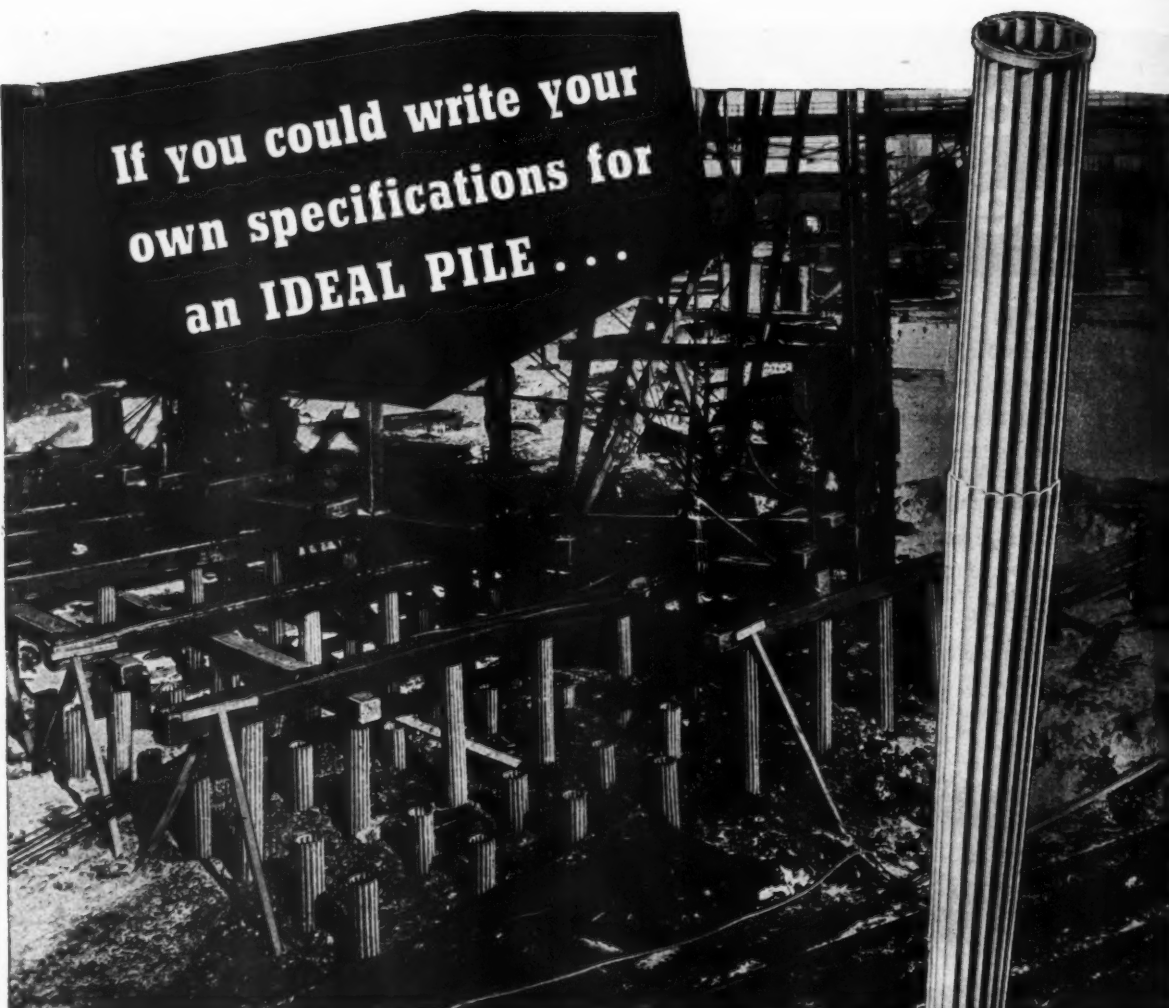
Buy War Bonds

## FAIRBANKS, MORSE & CO.

FAIRBANKS-MORSE BUILDING, CHICAGO 5, ILLINOIS

Canadian Fairbanks-Morse Co., Ltd., Montreal





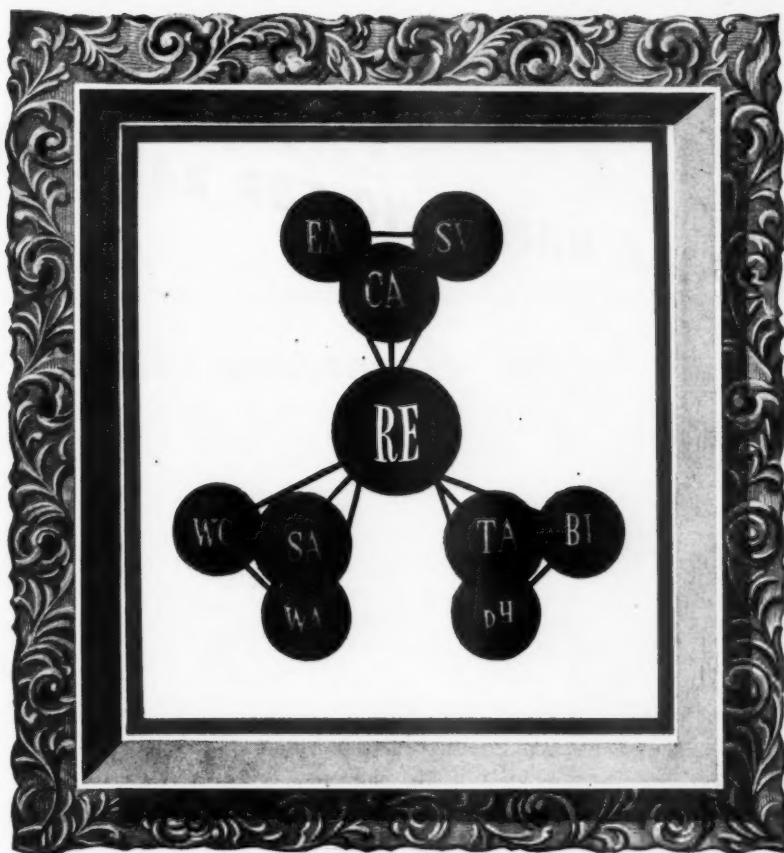
If you could write your  
own specifications for  
an IDEAL PILE . . .

## What more would you want than this?

ON thousands of jobs . . . large buildings, bridges, wharves, highway overpasses, and airports . . . Monotube tapered piles have proved themselves the last word in modern cast-in-place piled foundations. These strong, light-weight steel piles go down faster, handle easier, and lend themselves to quick, sure inspection before concreting. Tapered, cold-rolled construction gives them extra strength without extra weight. They can be driven with average job equipment . . . and *quickly extended* on the job to meet varying soil conditions. Available in a gauge, size, and taper to meet any requirement. The services of our consulting engineers are available now as always. Also, write for Catalog 68A. The Union Metal Manufacturing Company, Canton 5, Ohio.

**UNION METAL**  
*Monotube Tapered Piles*





## PORTRAIT OF A LOCOMOTIVE BEING BATHED

Whether you are removing a streak of oil from the fuselage of a Mustang, cleaning a locomotive, or wiping the nose of a Flying Fortress, this is the picture of working factors in the scientifically balanced chemical compound. It is also the picture of a milk bottle being washed. It is a railway station's terrazzo floors being mopped. *It is Turco in action.*

The relative value and balance of all the factors is determined by RE; for Research and Experience are the directing agents. They assign roles, give to each agent the correct emphasis, balance them all (one factor does not insure effectiveness in a compound any more than one drug in a prescription). RE symbolizes two decades Turco laboratories have devoted to solving industry's vital problems in the conditioning, maintaining and cleaning of surfaces. Take advantage of it on everything from washing a locomotive to preparing aluminum for anodizing. Call the Turco Field Service Man, or write to Turco.

- —Emulsifying Action disperses grease and oil as tiny globules, suspends them, and prevents redeposition.
- —Colloidal Activity disperses solids into minute particles easily removed.
- —Saponifying Value is the ability to convert organic fats and oils into soluble soaps.
- —Total Alkalinity (or acidity) is the total amount of either available for cleaning.
- —Buffer Index is the ability to absorb either alkaline or acid soil to prolong solution efficiency.
- —A yardstick for measuring the energy of alkalinity or acidity.
- —Solvent Action is the ability to put soil into solution.
- —Wetting Action lowers surface and interfacial tensions, causing solution penetration to base surface.
- —Water Conditioning removes or controls the elements which cause water hardness.
- —all the elements above are mobilized through Turco's Research and Experience.\*

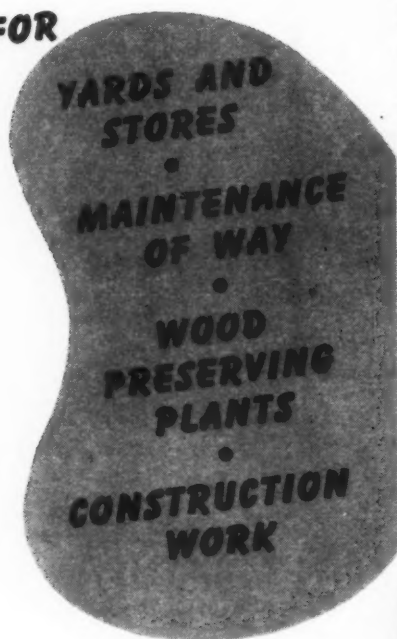
**TURCO**  
INDUSTRIAL CHEMICAL COMPOUNDS

\* For a fuller explanation of these vital factors, write for Turco's "The Chemistry of Chemical Compounds," on your letterhead, please.

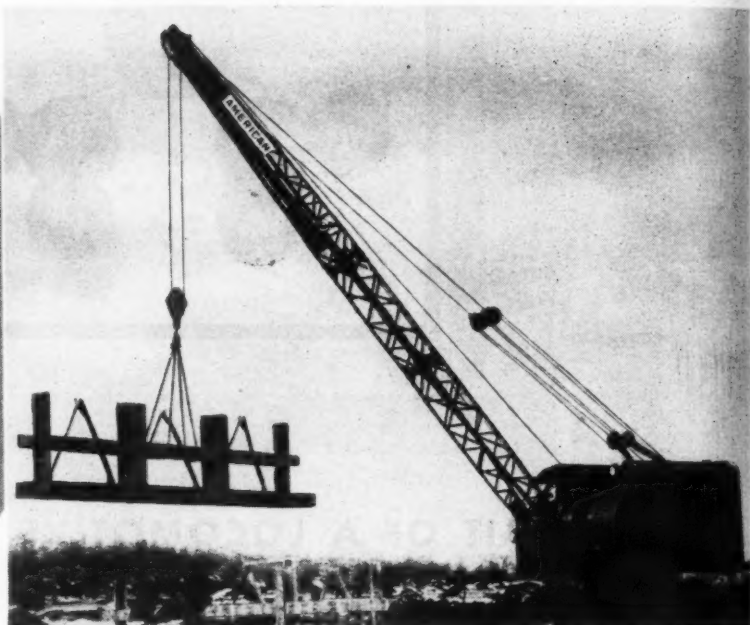
TURCO PRODUCTS, INC. Main Office and Factory: 6135 S. Central Avenue, Los Angeles 1 • Southern Factory: 4606 Henderson Street, Houston 10, Texas • Chicago Office and Factory: 125 West 46th Street, Chicago 9, Illinois • Offices and Warehouses in All Principal Cities

# *American* MATERIALS HANDLING FOR RAILROADS

FOR



THE *American* LOCOMOTIVE CRANE



The AMERICAN Locomotive Crane was designed for just this variety of materials handling work. Scattered over the country with the nations leading railroads, their mobility, ease of operation, simplicity of control, have demonstrated that they are an efficient materials handling method for bucket, magnet, and hook work. They make the use of old machines and other methods costly and wasteful by comparison.

Under your jurisdiction is materials handling that can be done better with an AMERICAN Locomotive Crane. Now is the time to look into it.

*Plan now . . . but wait for* **AMERICAN!**

4447

## AMERICAN

**MATERIALS HANDLING  
for EVERY INDUSTRY**

**AMERICAN HOIST & DERRICK CO.**

*Saint Paul 1, Minnesota*

CHICAGO

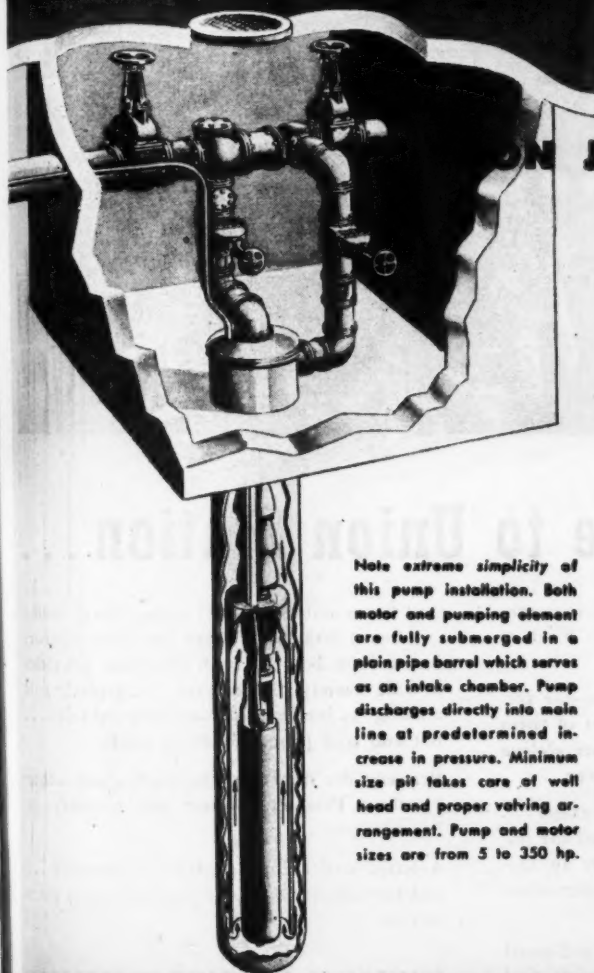
SAN FRANCISCO

NEW YORK



Wherever  
wire rope is fastened  
. . . use genuine  
**CROSBY CLIPS**  
with the Red-U-Bolt

**Here's how you can  
reduce your capital  
investment in  
Pumping Plants**



Note extreme simplicity of this pump installation. Both motor and pumping element are fully submerged in a plain pipe barrel which serves as an intake chamber. Pump discharges directly into main line at predetermined increase in pressure. Minimum size pit takes care of well head and proper valving arrangement. Pump and motor sizes are from 5 to 350 hp.

*by installing*

**BYRON JACKSON SUBMERSIBLES**

When increased pressures are required in existing water lines; it is no longer necessary to build costly booster stations, or provide extra pump attendants.

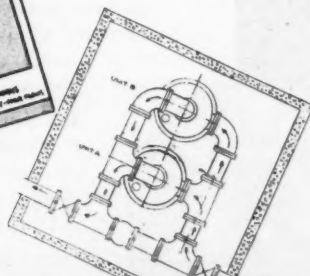
Instead—simply cut the main supply line at any desired point—along the right-of-way, in the freight yard, under the station platform, lawn or flower garden—and install a Byron Jackson Submersible Pump in a small pit.

Flooding cannot damage pump or motor—fire hazard is eliminated—thievery is stopped. No attendant is required as there are no stuffingboxes to pack or lubricating devices to check. Installation is entirely noiseless, completely automatic, and may easily be insulated against sub-normal temperatures.

The cost of a pit adequate for one or more Submersible Pumps is negligible when compared with conventional booster pump stations, and in many cases even the pit has been eliminated and the pump installation covered with sod or concrete.

As you blueprint improvements, extensions, conversions and replacements in your water system, Byron

Jackson engineers can show you how to reduce your capital investment in pumping plants by installing modern, practical, economical Submersible Pumps.



Floor plan of pit showing arrangement for two or more Submersible Pumps for single or parallel operation where pumping conditions demand variation in capacity and higher pressures.



**BYRON JACKSON CO.**

Houston • LOS ANGELES • New York





## ...from Here to Union Station...

Thousands of railway stations dot our country along the steel rails that band New York to San Francisco... Miami to Seattle.

Some of them are small...like the one pictured above. Others are large. Most of them face the problem of renovation, remodeling or deferred maintenance after the war.

Increased traffic... manpower shortage... material restrictions... have accentuated the importance of quality and durability in materials used for station construction and maintenance.

In all these stations... large and small... Flintkote Building Materials find an important place. They are durable, versatile and especially applicable to railway structures.

Mastic Flooring for station platforms

and floors stands up well under heavy traffic... heavy baggage... yet provides comfort under foot. For the roof, Flintkote provides a wide variety of materials... asphalt roll roofing... interlocking and strip shingles... hot and cold process built-up roofs.

Between the floor and the roof, many other Flintkote Products protect and beautify, at low cost.

A letter will bring you full information... and put almost 50 years of experience at your service.

### FLINTKOTE BUILDING MATERIALS

Asbestos and Asphalt Shingles and Sidings	Mastic Flooring
Cold Process Roofing	Insulation Board
Hot Built-up Roofing	Waterproofing
Roll Roofings	Protective Coatings

**THE FLINTKOTE COMPANY** • 30 Rockefeller Plaza, New York 20, N. Y.  
INDUSTRIAL PRODUCTS DIVISION

Atlanta • Boston • Chicago Heights • Detroit • Los Angeles • New Orleans • Waco • Washington • Toronto • Montreal

Railway Engineering and Maintenance





# DUFF-NORTON TRACK JACKS

... A JACK FOR EVERY JOB!

HERE'S WHAT  
RAILROAD MEN  
SAY\* ABOUT  
DUFF-NORTON  
JACKS ...

## FOR SECTION GANGS We use Single-Acting DUFF-NORTONS

Since section gang work consists mainly of surfacing and lining, and requires only a low lift, Duff-Norton Single-Acting Jacks do the job. This type of Jack raises the load on the down-stroke of the operating lever.



No. 117 Duff-Norton  
Single-Acting Track  
Jack.

## FOR EXTRA GANGS We use Double-Acting DUFF-NORTONS

With Duff-Norton Double-Acting Jacks the load is raised on both upward and downward strokes of the operating lever. This gives higher speed lifting, desirable for extra gangs who do mostly the work of placing ties and laying rail—where a high lift is required.



No. 1-D Duff-Norton  
Double-Acting Track  
Jack.

\* According to a  
recent survey of  
Railroad men.

There is a Duff-Norton Jack for every job—from track work to your bridge and structure maintenance. Choose Duff-Norton for absolute safety, power, dependability and ease of operation. Catalog 202 on request.

## THE DUFF-NORTON MANUFACTURING COMPANY

PITTSBURGH, PA.

Canadian Plant: COATICOOK, QUEBEC

Representatives in Principal Cities

# Flame Cleaning

## QUICKLY AND ECONOMICALLY PREPARES BRIDGES FOR REPAINTING

Flame cleaning of exposed steel surfaces in preparation for maintenance painting has helped many railroads overcome the wartime labor shortage—and, at the same time, pointed the way to lower costs and longer paint life on bridges, signal towers, tanks and steel cars.

Quickly and easily applied by means of torches and special tips developed by Airco, the oxy-acetylene flame burns off most, if not all, of the old paint and loosens the scale and rust.

The surface, after wire brushing, is free of all loose material. The flame also dries the surface moisture providing ideal conditions for repainting.

For complete information on the process—and suggested specifications covering all types of work, mail the coupon for copy of folder ADG 1066A.

REM

**Air  
Reduction**

60 East 42nd St.  
New York 17, N.Y.

Gentlemen:

Please send me a copy  
of Flame Cleaning Folder  
ADG 1066A.

Name \_\_\_\_\_

Title \_\_\_\_\_

Firm \_\_\_\_\_

Address \_\_\_\_\_

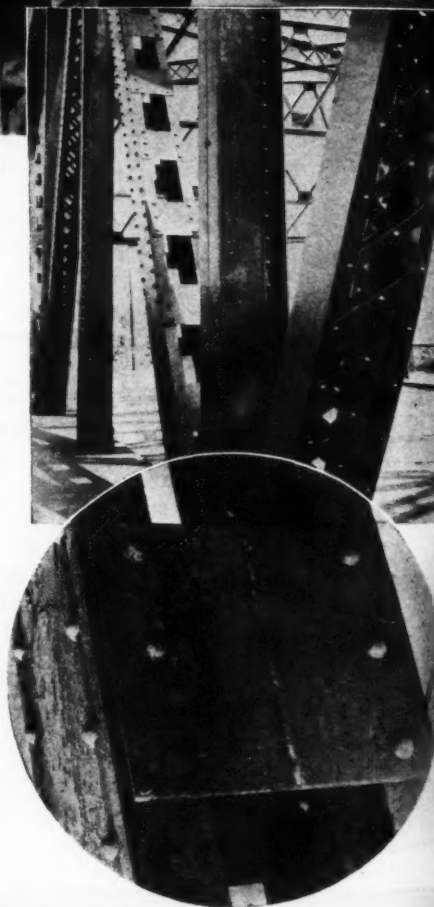
City \_\_\_\_\_ State \_\_\_\_\_



Flame Cleaning  
laced-web member.  
Flame easily reaches  
hard-to-get-at places.

After flame cleaning,  
the structure is now  
ready for application  
of the paint coat.

*Before and after. Left  
side of plate shows  
conditions encountered.  
Right side shows section  
after flame cleaning and  
wire brushing.*



### AIR REDUCTION

General Offices: 60 EAST 42ND STREET, NEW YORK 17, N. Y.  
In Texas: MAGNOLIA AIRCO GAS PRODUCTS CO. • General Offices: HOUSTON 1, TEXAS  
Offices in all Principal Cities

# *How* **TOURNAPULLS** **HELP** **RELOCATE 23 MILES OF ROCK ISLAND TRACK...** **ELIMINATE STEEP GRADES, BAD CURVES**

When you plan for tomorrow's faster, heavier traffic, try this job-proved method of cutting construction time and costs

Elimination of steep grades and bad curves requires relocation of approximately 23 miles of the Rock Island main line, between Perlee and Eldon, Iowa. Peter Kiewit Sons Co. of Omaha, Nebraska, is using six Super C Tournapulls to help move the 2,300,000 yards of earth involved. This new route will eliminate three miles of track; the new roadbed will permit laying of heavier rails.

## **Move More Dirt Cheaper**

New railroad construction like this Rock Island job, can be handled cheaper and faster with Tournapulls . . . they weigh less, have more power and travel at higher average speeds than overweight, slow-moving, crawler-type equipment. Self-contained Tournapulls operate off-track . . . no time lost switching to sidings, no interruption of vital revenue trains. With Tournapulls you make 50 to 60 minutes of every work hour productive.

## **Tournapulls Are Versatile**



Fast-moving, off-track Tournapulls load, haul and spread in one cycle of continuous operation . . . no big, expensive loading unit or special spreading tools needed. You save on equipment investment, require fewer men.

Tournapulls can save you time and money on such railroad construction and maintenance work as:

- New grade construction
- Curve relocation and grade reduction
- Strengthen and widen banks and slopes
- Dig and clean drainage ditches
- Grade for new sidings, spur and passing tracks
- Reinforce roadbeds
- Remove slides, fill-in and repair washouts
- Coal handling and stockpiling

## **Investigate Benefits**

To get your earthmoving handled quickly and at less cost, join the alert railroads who are equipping their crews with fast, modern, money-saving LeTourneau rigs. Let our experienced Field Engineers explain the benefits to you of the LeTourneau method—they'll gladly help you with your special problems. Fill in the coupon below and mail it TODAY for engineering assistance and FREE, illustrated folder on Tournapulls.

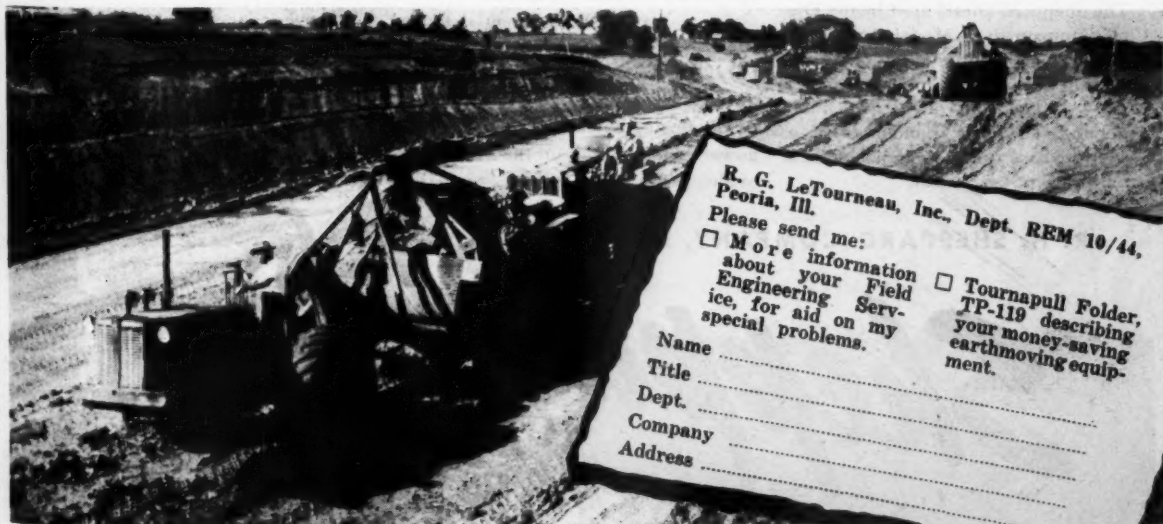
# **LETOURNEAU**

PEORIA, ILLINOIS • STOCKTON, CALIFORNIA

Manufacturers of TOURNAPULLS\*, DOZERS, CARRYALL\*, SCRAPERS, POWER CONTROL UNITS, ROOTERS\*, SHEEP'S FOOT ROLLERS, Tournarope\*, Tournatrailers\*, Tournaweld\*, Tournacranes\*.

\*Trade Mark Reg. U.S. Pat. Off.

Tournapulls are quickly pusher loaded. One pusher easily handles three or four Tournapulls, depending on length of haul. Note how Tournapull loading keeps cut and banks smooth, practically eliminates extra finishing costs.



R. G. LeTourneau, Inc., Dept. REM 10/44,  
 Peoria, Ill.  
 Please send me:

☐ More information about your Field Engineering Service, for aid on my special problems.

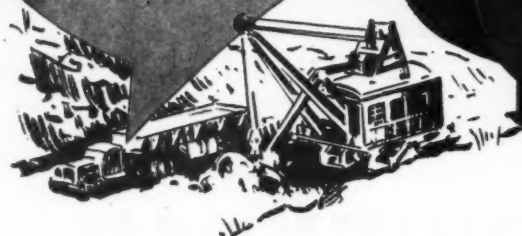
☐ Tournapull Folder, TP-119 describing your money-saving earthmoving equipment.

Name .....  
 Title .....  
 Dept. ....  
 Company .....  
 Address .....



# NEW *Sheppard* Installation in Strip Mine

**Pioneers  
NEW  
Use for  
Diesel Power**



THE Dye Coal Company of Cadiz, Ohio, has just installed a Model 6A Sheppard Diesel as the prime generator of power for maintenance equipment. This is a new use for a Diesel... and it points the way to improved operation and substantial power economies in similar installations.

The Sheppard Diesel used by the Dye Coal Company is a Model 6A direct-connected... by means of a double engagement flexible coupling... to an 18.7 KVA—AC 120/240 volt, 1200 R.P.M. generator. This unit is mounted on a steel beam base and is equipped with an automatic starting control.

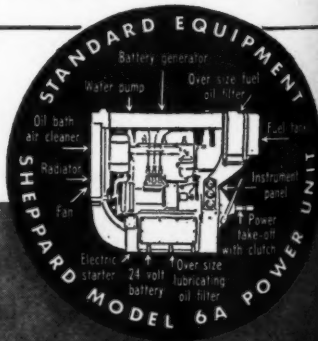
The Dye Coal Company will use this Sheppard Diesel to generate light and provide power for operating drill presses, grinders and other small tools in the field repair shop; for repair and maintenance of power shovels, bulldozers, trucks and other equipment for stripping operations. On priority, Sheppard Diesels are available NOW to essential industries. Sheppard Diesels for post-war use in all industries may be "reserved" through the Sheppard Post-Priority Plan. Before buying any Diesel or a substitute power source, check on the availability of Sheppards.

**R. H. SHEPPARD COMPANY, HANOVER, PA.**

***Sheppard***  
**ALL AMERICAN  
DIESELS**

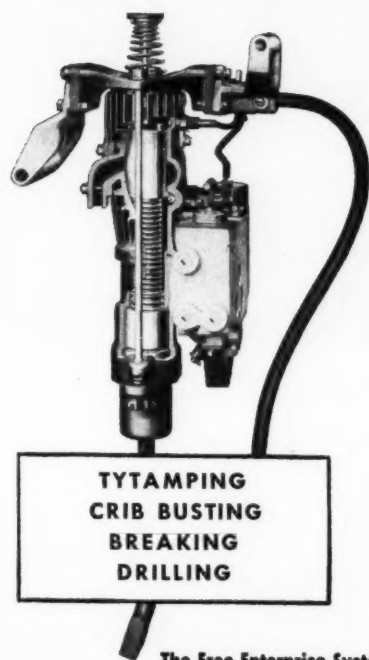
## Free Bulletin—JUST PUBLISHED— Shows Sheppard Pump Applications

Sheppard Diesels are standard equipment on the pumps of many nationally known manufacturers. Sheppard also supplies complete pump units. Learn how Sheppard performance is cutting pumping costs... increasing pump output... in diversified industries. Write today for free Sheppard pump bulletin... just published.





**GOOD  
WORKMEN  
DESERVE GOOD  
TOOLS**



**TYTAMPING  
CRIB BUSTING  
BREAKING  
DRILLING**

## **BARCO UNIT TYTAMPER**

Why pay good wages, then slow down a man's output with inefficient tools? Barco Unit Tytamperers were designed and perfected to enable good men to do more work...with less hardship on the worker. And Barcos have proved they pay a profit on hundreds of different railroad jobs... saving time, speeding the work. Rugged yet light and easily portable. For full particulars, write to: The Barco Manufacturing Company, Not Inc., 1805 Winnemac Avenue, Chicago 40, Illinois.

*In Canada: The Holden Co., Ltd., Montreal*

**The Free Enterprise System Is The Salvation of American Business**





## UNIFICATION...

Throughout the nineteenth century American railroads made amazing strides, spanning the vast prairies, scaling towering mountains, reaching out to every part of the country. Improvements in design, performance and utility of equipment had gone on apace. Rails, roadbeds, and maintenance had been greatly improved for safety and speed.

As the magnificent century of accomplishment drew to a close, aims and ambitions expanded beyond mere utility. Passenger schedules were stepped up and luxury equipment introduced to tempt America to know itself. The allure of elegant, safe and rapid travel drew those of the east to view the wonders of the west, while those of the west came to the east to enjoy its entertainments and culture. The welding of diverse communities and far flung areas into a unified nation and people was made possible

LUXURY TRAVEL THROUGH THE ROCKIES. The possibility of viewing scenic wonders of the West in comfort, lured many to whom it might

by the railroads.

This unification of American aims and ambitions, based on human rights, has made America a reservoir of armament, a full cupboard and a beacon to beleaguered people throughout the world.

American railroads today are sustaining the civilization they fed and fostered, in transporting the products of farms and factories, and the precious lives of freedom defenders.

Discharging their destiny requires the utmost use of equipment and the effective employment of every man-hour.

Fairmont's contribution to this gigantic effort is the saving of man hours in the basic need for right-of-way maintenance. Railroad maintenance men have collaborated with Fairmont engineers, for more than 35 years, in

OF ALL THE CARS IN SERVICE TODAY...



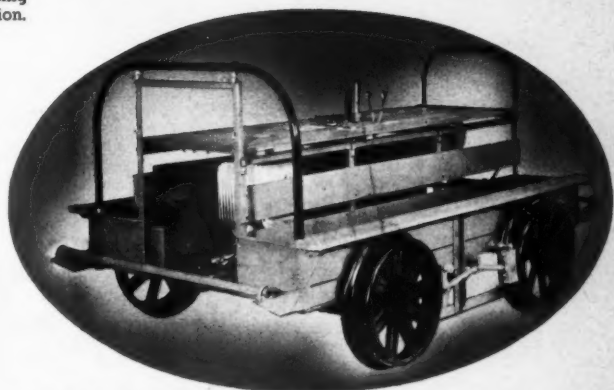
remained a vague land of "Indians" and wilderness. In addition to providing travel pleasure for many, it served the practical purpose of unifying the nation.

Developing the dependable, economical and adaptable Fairmont motor cars operating on railroads throughout the country today.

From the small inspection cars on up to the large gang cars accommodating crews and material, Fairmont has supplied equipment according to the needs expressed by the railroads. Fairmont Railway Motors, Inc., Fairmont, Minnesota.

# Fairmont

## RAILWAY MOTOR CARS

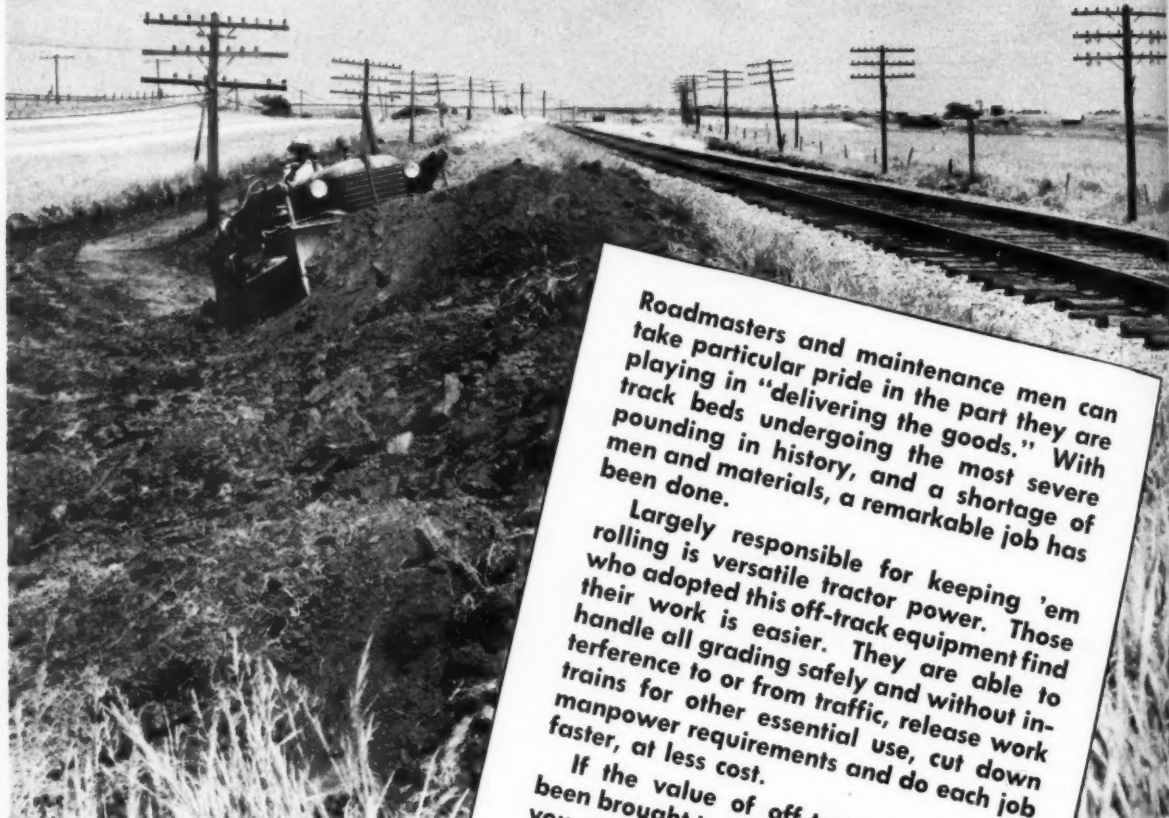


S2 Series G—2 to 10 man heavy duty section car. Powered by Fairmont's 8-13 H.P. RQ Hy-Load Roller Bearing Engine, this ruggedly built, roomy car can tow one to two loaded trailers up grades with maximum economy.

**A . MORE THAN HALF ARE FAIRMONT S**



# "A Railroad Is No Stronger Than Its Track!"



On the Burlington route of Ft. Worth and Denver City RR., this 2-cycle Diesel tractor, equipped with a Gar Wood bulldozer, builds up shoulders, widens banks and cuts drainage ditches . . . always working free of the tracks!

Roadmasters and maintenance men can take particular pride in the part they are playing in "delivering the goods." With track beds undergoing the most severe pounding in history, and a shortage of men and materials, a remarkable job has been done.

Largely responsible for keeping 'em rolling is versatile tractor power. Those who adopted this off-track equipment find their work is easier. They are able to handle all grading safely and without interference to or from traffic, release work trains for other essential use, cut down manpower requirements and do each job faster, at less cost.

If the value of off-track units hasn't been brought to your attention, it will pay you to investigate now. Be ready to handle peacetime work at lowest cost and in the most efficient way. Why not contact your Allis-Chalmers dealer! He will show you the many advantages of tractor power.

**ALLIS-CHALMERS**  
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.



**WE CAN GET TO THE HEART**

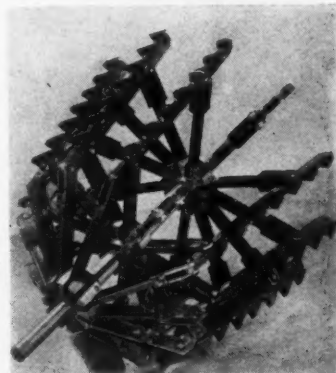
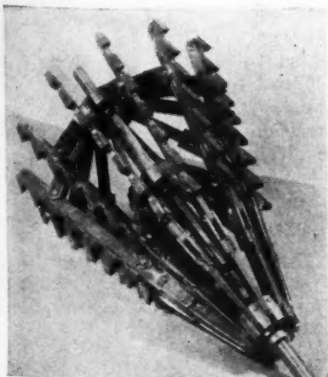
## **OF YOUR PIPE CLEANING PROBLEMS**

In pipe cleaning, like in things medical, it takes a specialist to do the job right, to do the job well. All of our engineers are thoroughly trained in pipe cleaning work, so you can be sure that with our correct and special tools they can do your pipe cleaning job best.

Let our specialists diagnose your water pipe, sewer pipe, gas main, or any other type of pipe problem to show you what advantages can be gained by having pipes cleaned expertly—Now!

Pipes free from sludge and tubercles will help your railroad to maintain its service standards during the existing emergency and to be fully prepared to adequately meet postwar activities.

*Specially designed tools like those on either side will remove hard deposits such as lime, iron, and manganese.*



# **PITTSBURGH PIPE CLEANER COMPANY**

**433 Melwood Street, Pittsburgh 13, Penna.**

**PHILADELPHIA - NEW YORK - BALTIMORE - WASHINGTON - CHICAGO - ST. LOUIS - DETROIT**

**HOW LIGHT, POWERFUL**

# *Thor* **Air Tools** **Speed Major Railroad Jobs!**

**Y**OU can keep your production moving at an ever faster pace with THOR Air Tools. Basic reasons why THOR tools work harder and faster are

shown in these typical examples of major shop and yard jobs. For helpful information on the complete line of THOR Air Tools write for Catalog No. 52B.



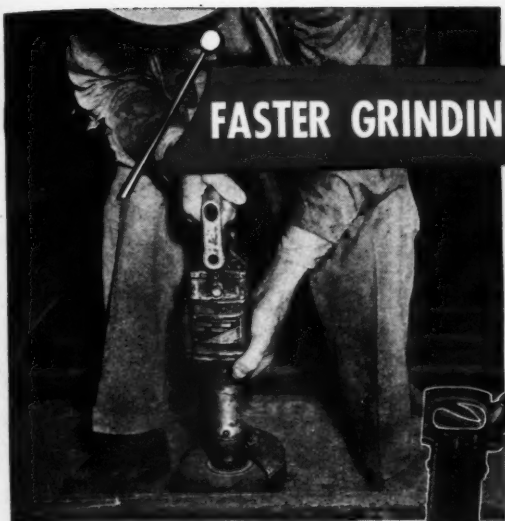
## **FASTER RIVETING!**

**THOR Riveting Hammers** give you everything needed for faster, easier riveting. 1. Special inlet ports in the air-tight, balanced poppet valve provide perfect throttle control for easy regulation of speed and blow. 2. The THOR Main Valve, precision-fitted to use effectively *all* the air, gives you hard-hitting, dependable power. Made *without* port holes which plug up or start cracks, it assures longer valve life, lower maintenance costs.

THOR Riveting Hammers are made in Standard and Heavy Duty types, in 4" to 9" strokes; with open, closed and inverted type handles.

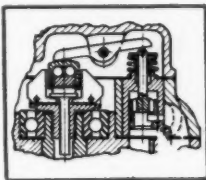


Note the thick, substantial walls and the absence of port holes in the Thor Main Valve — to assure less valve breakage and lower maintenance. Inlet and Exhaust ports are separated by three different valve diameters to make air leakage and power-loss impossible.



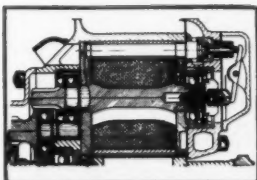
## FASTER GRINDING!

**Here's why** you get top speed grinding with THOR Air Grinders. They start instantly . . . thanks to THOR's "Air Behind the Blades" Principle. They remove more metal per hour . . . result of the extra power developed by the wider blades and deeper slots of THOR's one piece rotor. And they maintain spindle speed at top efficiency . . . one function of THOR's Safety Governor (in diagram). There are fifty different models of THOR Air Grinders for grinding, cleaning, buffing, and brushing.



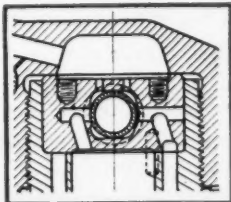
## FASTER DRILLING!

**Every THOR Air Drill** from the huskiest, big-capacity machines to the tiny, high-speed models, has the speed and stamina for today's three-shift schedules. THOR's compact, one-piece construction of rotor and shaft (in diagram) provides deeper slots and wider blades — to deliver a steady flow of power. For faster handling, size and weight are cut to the minimum. These are but a few of the features you get in seventy-seven sizes of THOR Air Drills for every type of light and heavy duty drilling.



**Positive valve action** that insures a smooth flow of power . . . completely graduated throttle valve control . . . and vibration kept amazingly low — with these, THOR Chipping Hammers speed your work. You get easy starting with a light blow and complete control right up to full speed and power . . . to handle a full range of chipping. With THOR's Cylinder Rocker Valve (in diagram) measured quantities of live air power both the forward and return strokes for exactly the right combination of speed and smoothness. Available also in Plate and Spool Valve types, THOR Chipping Hammers offer a full range of sizes, with  $\frac{3}{4}$ " to 4" strokes, open or closed style handles — a hammer for every job!

## FASTER CHIPPING!



### THOR AIR TOOLS FOR EVERY JOB

• RIVETING HAMMERS • CHIPPING HAMMERS  
• SCALING HAMMERS • DRILLS • GRINDERS  
• SAWS • SUMP PUMPS • BALANCERS  
• HOISTS • SCREW DRIVERS • WRENCHES

*Thor*

Portable Pneumatic and Electric Tools

**INDEPENDENT PNEUMATIC TOOL COMPANY**

600 W. JACKSON BOULEVARD, CHICAGO 6, ILL.

Branches in Principal Cities

# "CHEMICAL MANPOWER"

## ***The Practical Method for Obtaining Weed-Free Track***

A Chipman weed control program provides the *practical* answer to the problem of maintaining a weed-free track. And now — more than ever — "CHEMICAL MANPOWER" is performing an essential job in keeping roadbeds clean when labor is least available.

ATLAS "A" and ATLACIDE are chemical weed killers of proven value. They kill weed roots with a progressive reduction in the amount of weed growth after each treatment. An annual weed killing program insures improved track condition. Maintenance costs are reduced as the program progresses and the ultimate goal of clean track at a minimum cost is soon reached.

Application of the chemical with our standard spray equipment is simple and rapid, causing a minimum of interference with regular train movements. And the manpower required is small compared to other weed killing methods.

ATLAS "A" is a Sodium Arsenite Weed Killer furnished in liquid form. We recommend its use for the control of all types of annual weeds and most perennials.

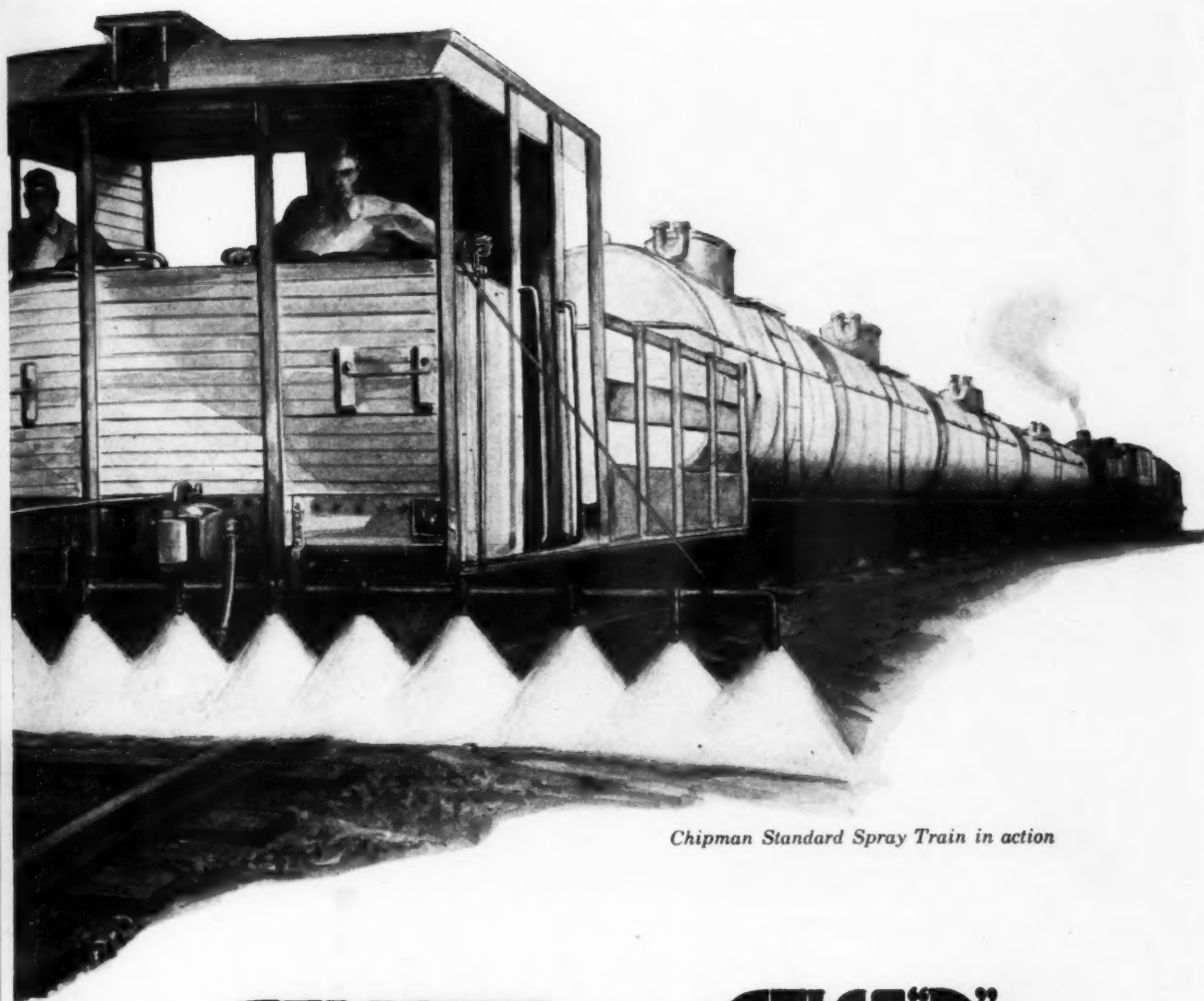
ATLACIDE, our non-poisonous Chlorate Weed Killer, is furnished in both liquid and dry form. It is especially indicated for the control of deep-rooted perennial weeds.

Now is the time to plan your program. A letter describing your weed problem will be welcome, and we feel sure that our many years of experience in weed control service can be helpful to you.

*Over Twenty-five Years of Weed Control Service*





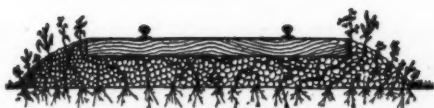


*Chipman Standard Spray Train in action*

**ATLACIDE**  
CHLORATE WEED KILLER

and

**ATLAS "A"**  
ARSENICAL



*Before Treatment*



*After Treatment — ROOTS DIE*

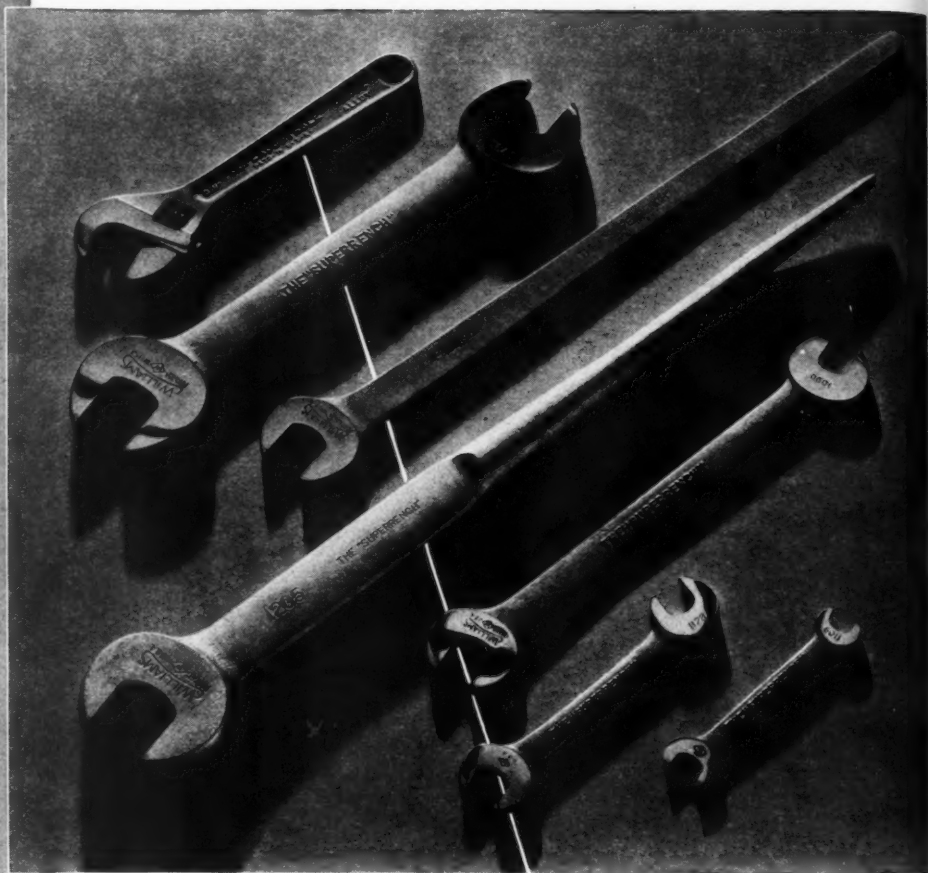


*Final Result — CLEAN BALLAST*

**CHIPMAN CHEMICAL COMPANY, Inc.**

Chicago, Ill. • BOUND BROOK, NEW JERSEY • Portland, Ore.

Houston, Texas • Palo Alto, Calif. • No. Kansas City, Mo. • Winnipeg, Man.



## *That industry may compete*

The same tools that help win wars will lend new skill to the creative hand of postwar industry. Tomorrow these tools will produce those wanted things which a strife-weary world has long gone without . . . and produce them at less cost that more may enjoy them.

J. H. WILLIAMS & CO.,  
Buffalo 7, N. Y.

**WILLIAMS**  
DROP-FORGINGS AND  
DROP-FORGED TOOLS

# For Improved Maintenance of Rail Joints

use the  
**NORDBERG  
POWER  
WRENCH**



**Nuts Accurately Tightened**

Adjustable overload release assures uniform tension on all track bolts. Variation of torque on nuts is not more than 5 percent.

**Fast and Powerful**

Rapid progress with ample power for starting "frozen" nuts is possible with two socket speeds — 122 rpm on high and 35 on low.

**All Nuts are Easily Reached**

The sockets on the swinging wrench arm easily reach nuts at inside and outside of rail and at switches, frogs and crossings.

**Accessories Available**

Accessories adapting the wrench for driving screw spikes and for drilling rail can be furnished as extra equipment.

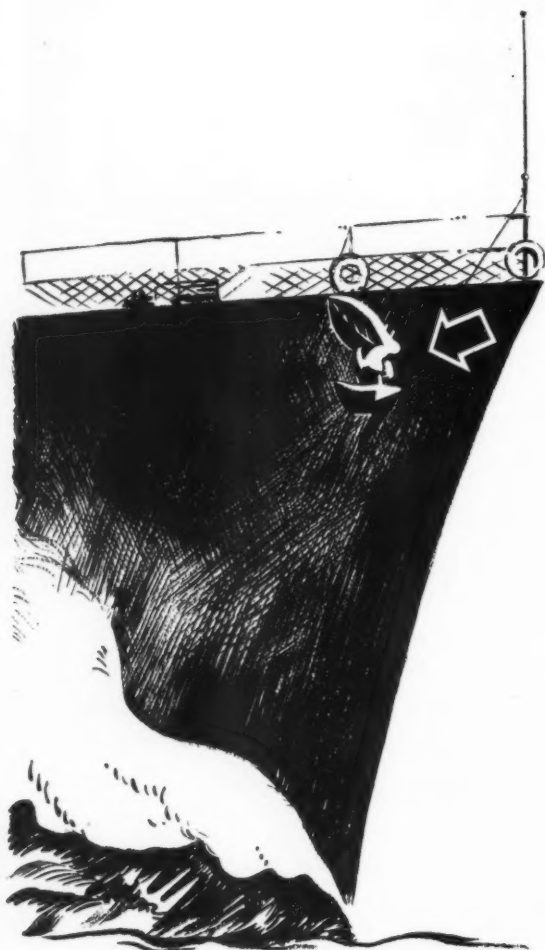


## **NORDBERG MFG. CO.**

**MILWAUKEE  
WISCONSIN**

Export Representative—WONHAM Inc.—44 Whitehall St., New York

**YOU CAN'T HOLD A 30,000  
TON BATTLE WAGON  
WITH A 100-LB. ANCHOR!**



**Woodings Rail Anchor**

**Neither can creepage  
be stopped on under-  
anchored track. When  
you anchor, apply  
WOODINGS and  
be sure you use  
enough.**

MEMBER



**WOODINGS FORGE & TOOL CO.**

**VERONA, PA.**

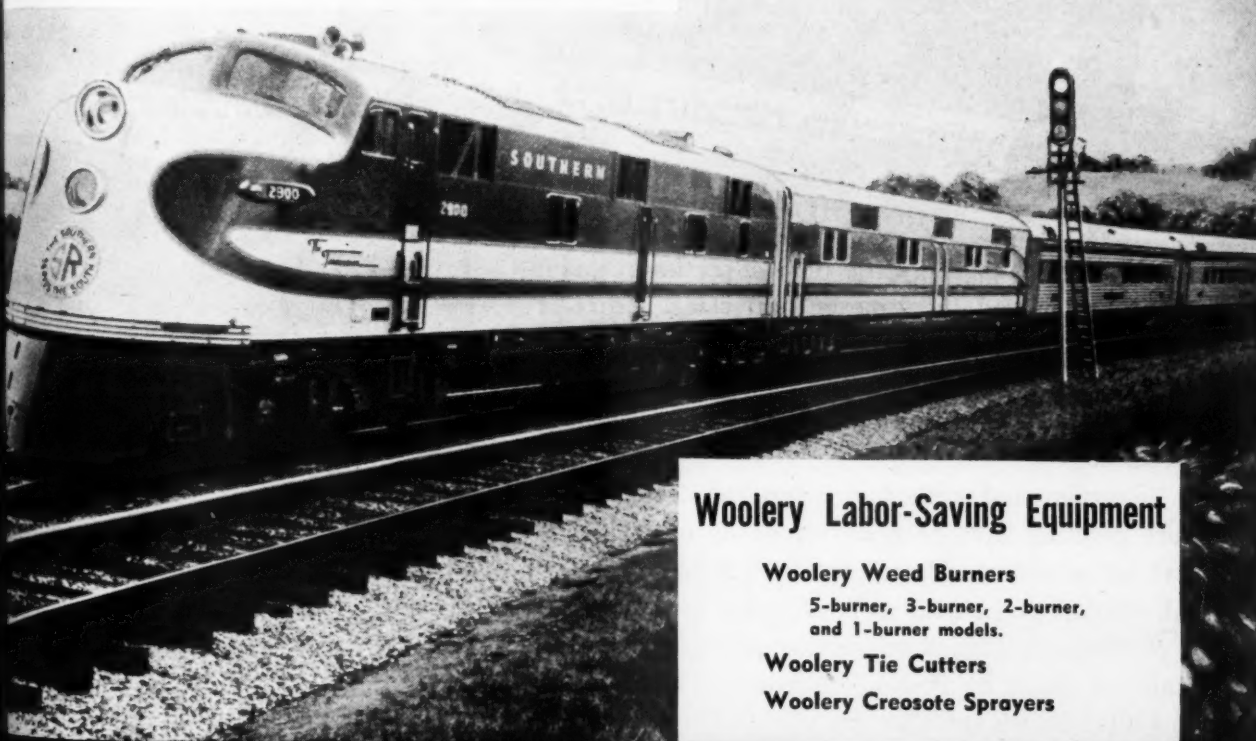
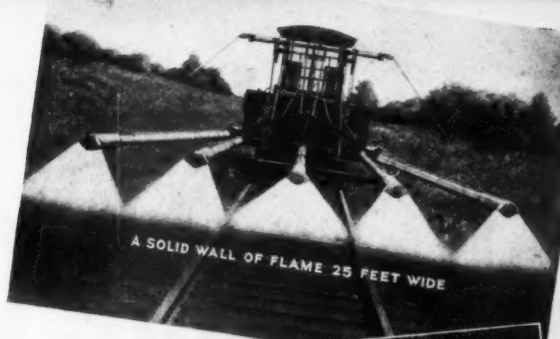


# Up-to-the-Minute SERVICE

In this day of necessary speed and haste, up-to-the-minute service is provided by Southern for its customers with the Southern, the Tennessean, and its other crack streamliners. To assist in maintaining this service, Southern roadway officers employ WOOLERY WEED BURNERS to keep their track free and clear of destructive vegetation.

The Southern and more than seventy-five other roads, utilizing hundreds of Woolery Weed Burners, have discovered the operating efficiency offered by this up-to-the-minute equipment in actual day-to-day use.

MEMBER



## Woolery Labor-Saving Equipment

### Woolery Weed Burners

5-burner, 3-burner, 2-burner,  
and 1-burner models.

### Woolery Tie Cutters

### Woolery Creosote Sprayers

## WOOLERY MACHINE COMPANY

MINNEAPOLIS

Pioneer Manufacturers of

MINNESOTA

### RAILWAY MAINTENANCE EQUIPMENT

RAILWAY WEED BURNERS • MOTOR CARS • TIE CUTTERS • TIE SCORING  
MACHINES • RAIL JOINT OILERS • CREOSOTE SPRAYERS • BOLT TIGHTENERS

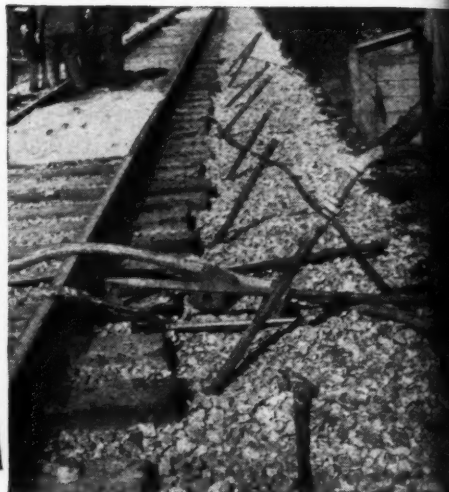
EXCLUSIVE EXPORT REPRESENTATIVES: PRESSED STEEL CAR COMPANY, INC., PITTSBURGH, PENNA.



# Equipment and Methods for Pressure Grouting Track



Equipment, including small tilting mixer, grout trough and pipes discharging into commercial pneumatic grout unit on Chicago, Burlington & Quincy Railroad at Salem, Neb.



Injection points in place on Wabash Railroad at Thurman, Ind. Grout hose is attached to point in foreground.

Stabilizing roadbeds by injections of portland cement grout has passed the experimental stage. Years of service on major railroads have demonstrated that pressure grouting gives positive results in eliminating water pockets and effects consistent saving in maintenance.

Equipment and methods to insure satisfactory pressure grouting have been developed by the railroads and equipment manufacturers. Work is done by regular railroad gangs with no interruption of war traffic.

Write for illustrated information sheet, "Stabilizing Railroad Track by Pressure Grouting." Mailed free in United States and Canada.



Grout being injected through pipe in foreground, travels under bed and blows out through uncapped injection point six feet away. Operation is on Baltimore & Ohio Railroad at Niles Junction, Ohio.

## PORTLAND CEMENT ASSOCIATION

Dept. 10-27, 33 West Grand Avenue, Chicago 10, Illinois

A national organization to improve and extend the uses of concrete... through scientific research and engineering field work

BUY MORE  
WAR BONDS

# THE NEW ORTON-JUPITER PILE DRIVER

• The locomotive type pile driver—with collapsible leads and horizontal trusses—which can go out and drive pile trestles, then at high speed under its own power get off the main line track, has been a good tool for railroads which could afford an expensive one-purpose unit • Orton has now added to this traditional machine a new versatility which enables it to be used for so many other purposes that it is well within the budget requirements of all Class A railroads, justifying the purchase of many more of these machines than has been good practice in the past • The new Orton pile driver is built with the long car body and horizontal trusses carrying the leads so desirable for heavy pile-driving where the load must be kept to a minimum on each bent. These trusses and leads can be quickly removed and a crane-type boom substituted. The pile driver then becomes a high-speed, heavy-duty crane, which can place concrete caps on top of the piles, handle girders, store and drive heavy concrete piles and do all of the heavy lifting before and after the piles are driven • In the Jupiter the railroad has a high-speed locomotive pile driver ready to take care of emergency washouts and similar work. It also has a machine capable of so much more work that many railroads will find it economical to have one in every division, with a correspondingly increased ability to greatly reduce time losses in repairing washed-out track.

*Send for detailed specifications*

**ORTON CRANE & SHOVEL COMPANY • 608 S. Dearborn St., Chicago 5, Ill.**



**NEW VERSATILITY!**

**FOR AN OLD**



# How Long

**MEMBER**

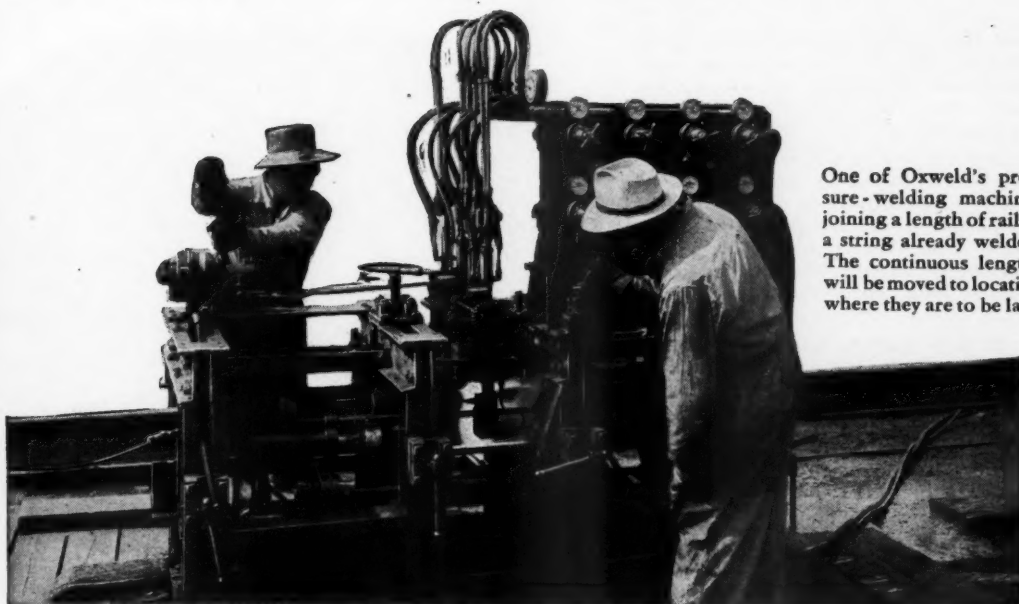


Oxweld congratulates the members of the Roadmasters and Maintenance of Way Association who are continuing, through committee activities—but without the benefit of their annual convention—to foster important technical advances in railroad practice.

SINCE 1912 — THE COMPLETE OXY-ACETYLENE SERVICE FOR



# Can a Rail Be?



One of Oxxweld's pressure-welding machines joining a length of rail to a string already welded. The continuous lengths will be moved to location where they are to be laid.

When Oxxweld's pressure-welding method is used there is practically no physical limit to the length of rail that can be installed. The length is determined by the number of rails that can be handled on the welding site and the weight to be moved.

Rails joined by Oxxweld's pressure-welding method provide a continuously smooth surface. Rail end batter and joint maintenance are eliminated. Rail lasts longer because the smooth surface and elimination of bolt holes and angle bars reduce corrosive and abrasive wear.

The advantages of pressure-welded rail make it particularly well-suited for use on bridges,

tunnels, crossings, and station platforms.

Continuous pressure-welded rail can be laid with a minimum of traffic delay, and installed in the same manner as standard length rail.

Your Oxxweld representative will be glad to give you the latest information on how pressure-welded rail can be used to advantage on your road.

\* \* \*

*You may have read the article in RAILWAY AGE of February 12, 1944, entitled "How Long Can a Rail Be?", an impartial report on the performance of continuous rail. If not, let us send you a copy.*

## THE OXXWELD RAILROAD SERVICE COMPANY

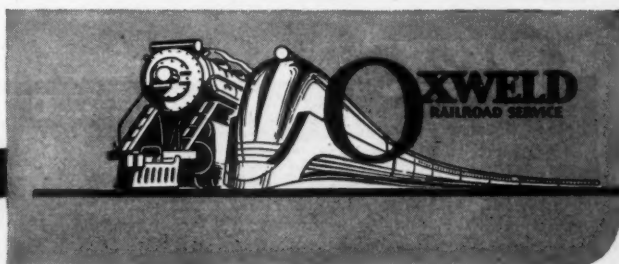
Unit of Union Carbide and Carbon Corporation



Carbide and Carbon Building Chicago and New York

**BUY UNITED STATES WAR BONDS AND STAMPS**

AMERICAN RAILROADS



# PUZZLE:

## HOW TO LINE A TUNNEL WITHOUT DISRUPTING TRAFFIC?

That sounds like a tough one, doesn't it? Actually the solution was easy, as Denver and Salt Lake Railway engineers discovered. The answer? Rex Pumpcrete—the pump that pumps concrete through a pipe line.

Concrete was mixed in a Rex 14S mixer located at the nearest tunnel portal or most adaptable site and pumped by Pumpcrete through a six-inch pipe line to the top center of 10-foot length steel forms. Forms, collapsible at top center, were equipped with rollers for easy transportation. For long moves they were carried in flat cars.

Pumpcrete eliminated the need for scaffolding, chutes, and other bulky equipment. As many as 30 trains a day passed through the tunnel without delay and the Pumpcrete kept right on pumping as the trains passed by.

Many other important railroad constructions, culverts, underpasses, bridges, snowsheds or station work are "concrete by pipe line" jobs. Pumpcrete simplifies concrete placement because it can move concrete 1200 feet horizontally or 120 feet vertically, eliminating the need for erecting structures that might delay rolling stock. Seven major railroads use Pumpcreters for a wide variety of concreting needs.

For complete information on Pumpcrete send for your free copy of Bulletin No. 404. Chain Belt Co., 1601 W. Bruce St., Milwaukee 4, Wis.



*Tunnel on Denver & Salt Lake Railroad being lined with concrete. Pipe line at right carries concrete from Pumpcrete, 600 feet distant, to top center of steel forms.*

*Machine at left is a Rex 14S Mixer. It discharges concrete into the round hopper of the Pumpcrete below.*

# REX

## CONSTRUCTION MACHINERY



PUMPS



PAVERS



PUMPCRETES

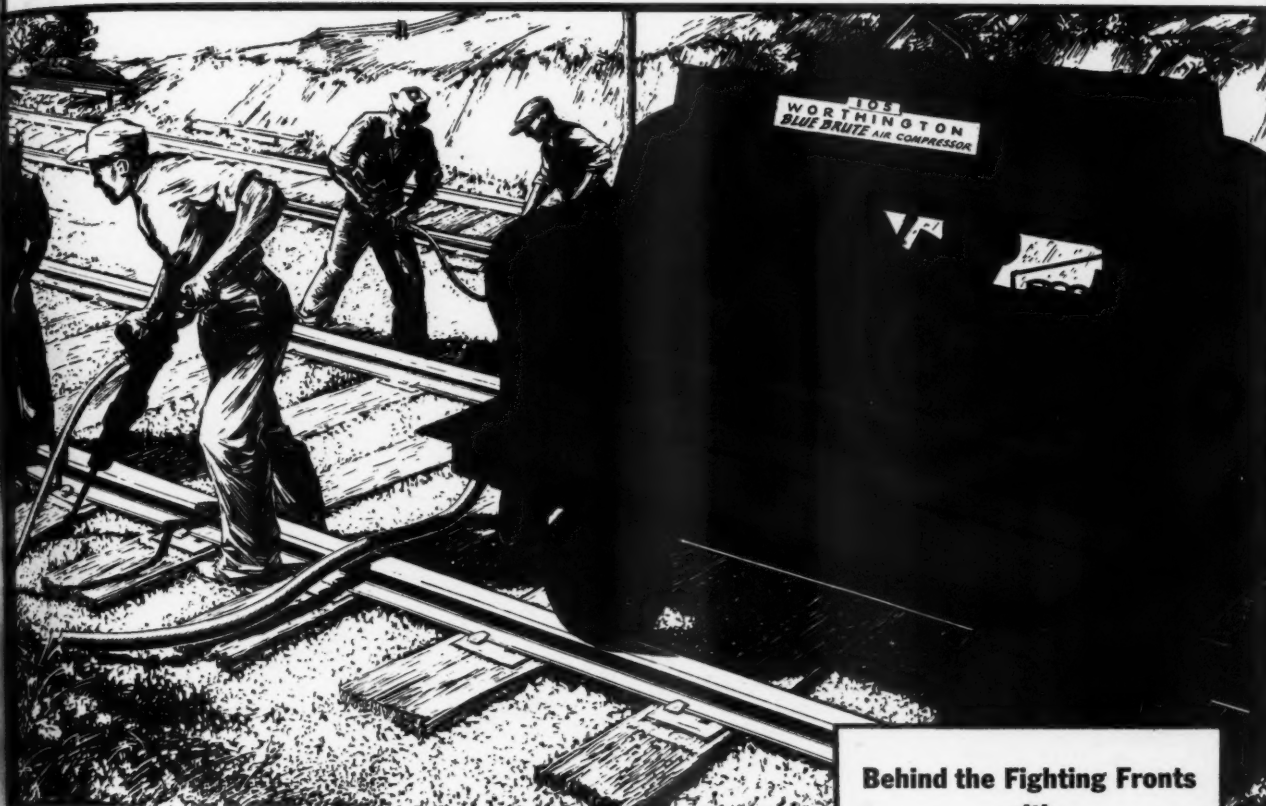


MOTO-MIXERS



MIXERS

# "ANCHOR MAN" OF YOUR FASTEST TRACK TEAM...



RAILROAD MEN maintaining roadbed for Victory's mighty loads know Blue Brute Track Teams as "anchor men" for the biggest relay race in transportation history.

The 105' Rail Car Compressor shown above provides the time-saving strength they need. It's made for easier breathing, less vibration, better lubrication, longer life.

Check a few of its strong points. Feather Valves\*, simplest, most efficient, eliminate common causes of valve break-

down. Three-point suspension of engine and compressor "cradles" them both in one integral housing, prevents shock-distortion and misalignment. Forced feed lubrication throughout.

Then team it up with Blue Brute WTT-7 Tie Tampers, strong, but stripped lean for speed by an improved design, and with new type, leakproof air throttles to end air loss. You'll get results: more lineal feet per day of tamped roadbed... at lower cost. In other words, more worth from air with Worthington.

Behind the Fighting Fronts  
with

## BLUE BRUTES

With 250,000 railroad men in military service, American railroads carried a total of 725,447,456,000 ton-miles in 1943 — 13.7% more than in 1942! With maintenance of way an increasing problem, Blue Brute railroad compressors and tools are more important than ever for repair and maintenance of track here, and on the fighting fronts.\*\*

\*\*Blue Brutes are painted olive drab for the Army, battleship gray for the Navy.

\*Reg. U. S. Pat. Off.

PC4-18

Get more **WORTH** from air with **WORTHINGTON**

MEMBER



# BUY BLUE BRUTES



**WORTH** BEHIND THE FRONT  
**WORTHINGTON**



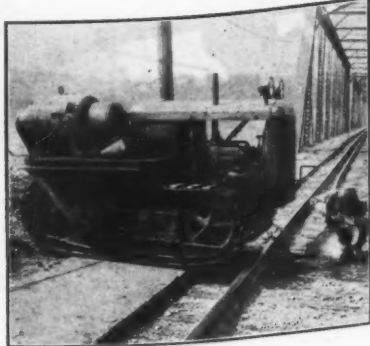
Worthington Pump and Machinery Corporation, Railroad Compressor and Tool Division, Holyoke, Massachusetts

compressors from 60 to 500 cu. ft. capacity in mount-  
to suit all jobs. Rock Drills and Air Tools that have

always set the pace for easy operation — available in  
a wide range of weights and sizes.



# *Cletracs are ready -*



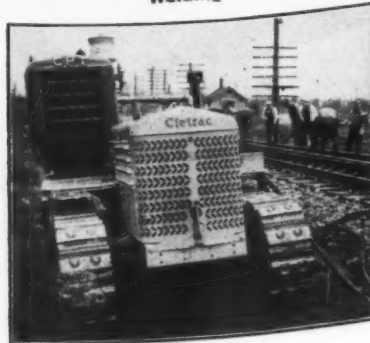
Welding



Bulldozing



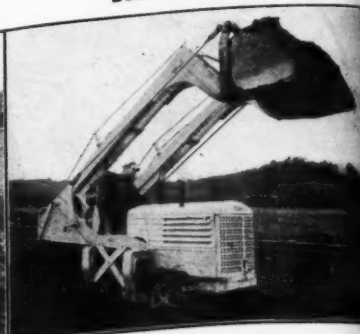
Bull Clam Shovel



Tamping Ballast



Scraper



Front End Loader

## to help power the Biggest Maintenance Task in Railroad History...

**W**ITH rails and roadbeds taking the heaviest pounding in years, tremendous tasks of maintenance and repair face every railroad maintenance crew.

For these crews, Cletracs are the "high-ball" signals of help in important jobs such as ditching...hauling...loading...ballast tamping...welding...grading...and other maintenance work requiring mobile power.

Many types of special equipment, such as that illustrated, particularly designed for railroad use, are available for Cletracs.

Under government regulations a wide variety of Cletrac Tractors, gasoline or diesel, are specifically set aside by WPB for railroad maintenance. Write us for information on how to equip your maintenance crews with time-saving, dependable, economical Cletrac power and traction.

THE CLEVELAND TRACTOR COMPANY • 19300 Euclid Avenue • Cleveland 17, Ohio



**CLETRAC *Tru-Traction* TRACTORS**

GASOLINE OR DIESEL

MEMBER







## It eats the same grub as planes

**And likes it!** . . . Yes, a Homelite Portable Generator can be operated on high octane, highly leaded aviation gasoline. No special diet is necessary . . . even 100 octane gas, the fuel of planes, can't harm a Homelite's built-in gasoline engine.

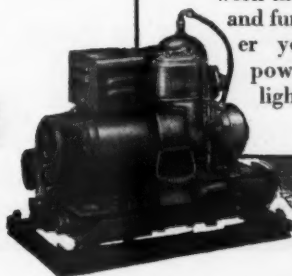
The simple reason is this . . . the Homelite *two-cycle* engine has no exhaust valves to burn out. That's right . . . no valves to foul with lead or carbon . . . no valve seats to reface. Its only valve is a simple rotary valve that governs the flow of fuel.

This, plus automatic voltage regulation, a lubrication system that supplies fresh, clean oil at each revolution, are some of the many reasons why thousands of rugged Homelite Portable Gasoline-engine-driven Generators are working in and around our military planes everywhere.



# HOMELITE CORPORATION

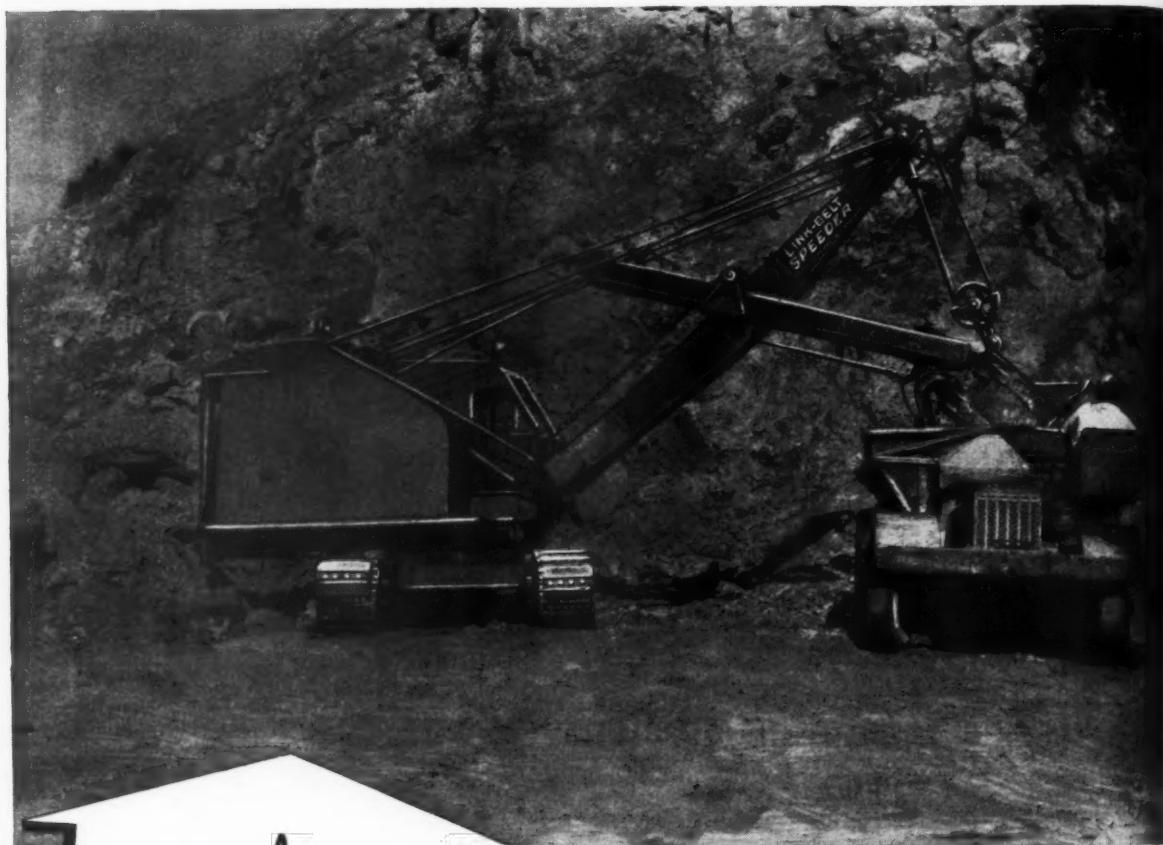
PORT CHESTER, NEW YORK



A Homelite Portable Generator isn't too fussy how you treat it or how you use it. Just give it some gasoline with a proper mixture of oil and it will work all day and night. It will work in rain, snow, sleet or heat and furnish all the electric power you need for operating powerful, flickerless flood-lights or handy electric tools.

# RAILROADS ARE USING LINK-BELT SPEEDERS

*where there's a tough job to be done!*



A  
**LINK-BELT SPEEDER  
IN THE C. B. & Q.  
BALLAST PLANT**

These rugged, easy-to-handle machines provide the advantages of off track equipment for railroads throughout the country. They can be used anywhere and no job is too hard for them to handle!

## LINK-BELT SPEEDER

*Builders of the Most Complete Line of*  
**SHOVELS-CRANES-DRAGLINES**  
LINK-BELT SPEEDER CORPORATION, 301 W. PERSHING ROAD, CHICAGO-9, ILL.  
(A DIVISION OF LINK-BELT COMPANY)

***Here's a New, Easier, More Economical Way  
to Seal Car Windows***

# **PRESSTITE**

## **EXTRUDED GLASS SEALER TAPE**

Originally developed to meet the rigid requirements of aviation usage, Presstite's No. 23212 Extruded Glass Sealer Tape offers you a better, easier, and long-lasting flexible seal for railway car windows.

This Presstite sealing compound is non-oxidizing and non-bleeding. It will not harden at temperatures up to 175°F. and remains flexible at temperatures as low as minus 60°F. It has high adhesion to glass, wood, and all metals.

Developed to seal synthetic glass windows, windshields, gun turrets, etc., of heavy bombers and other combat and cargo airplanes, this sealing tape has been thoroughly proven in this exacting type of service.

Presstite Extruded Glass Sealer Tape is furnished in tape or ribbon form in various thicknesses and weights to meet your requirements—making it extremely easy and economical to use.

If you'll send us your requirements, we'll gladly send samples without cost or obligation. For better window sealing, write to Presstite today.



**PRESSTITE**

SEALING COMPOUNDS

**PRESSTITE ENGINEERING COMPANY**

3964 Chouteau Avenue, St. Louis 10, Mo.

# NEW TYPE THERMIT WELD CUTS TRACK MAINTENANCE

**Adaptable For Main Line Track... For Tunnels,  
Crossings and Other Short Stretches**



1. Thermit has reacted, Thermit weld metal filling the mold.



2. Close-up of mold box.



3. Welded rail joint after removal of mold, but before cleaning mold of slag and excess metal.

The new fusion type of Thermit weld is ideally suited to joining rail into long continuous stretches. The Thermit steel welds the rail ends into a sound, durable, homogeneous unit, eliminating all further need for joint maintenance—the major item in track maintenance costs.

In the famous 6.2 mile Moffat Tunnel, on the Denver & Salt Lake Railroad, bad corrosive conditions had brought rail joint maintenance to a high level. As a solution, Thermit welded rail has twice been installed in continuous lengths from portal to portal.

Such railroads as the Pennsylvania, Southern Pacific, Baltimore & Ohio, Delaware & Hudson, Erie, Northern Pacific, Great Northern have also used Thermit rail welding to reduce track maintenance costs. The new fusion type of weld is practical for short stretches—such as in tunnels, for highway crossings and platform track. The equipment is light and portable and the welding can be done at location by your own section crews.

*We have produced a fifteen-minute color and sound 16 mm. moving picture, "Thermit Rail Welding at the Moffat Tunnel", which shows the Thermit process in detail. Prints are available for showing before interested groups.*

## METAL & THERMIT CORPORATION

120 BROADWAY, NEW YORK 5, N. Y.

ALBANY • CHICAGO • PITTSBURGH • SO. SAN FRANCISCO • TORONTO

Specialists in welding for nearly 40 years. • Manufacturers of  
Murex Electrodes for arc welding and of Thermit for rail welding.



Railway Engineering and Maintenance

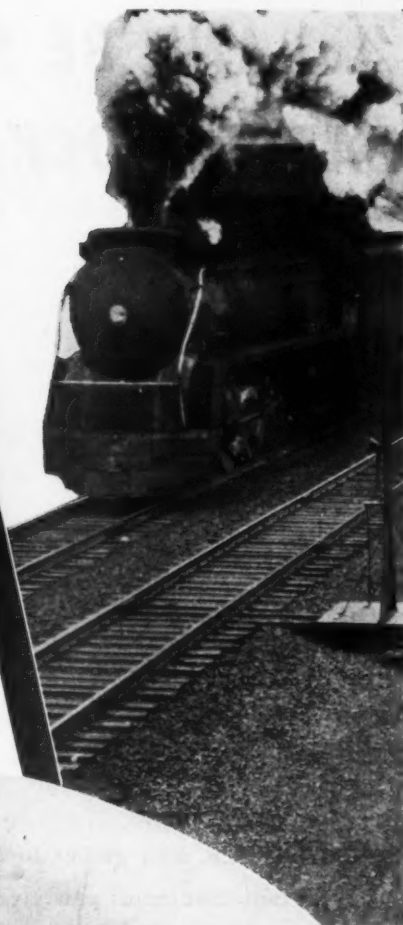


# Clean Ballast

## A MODERN RAILROAD ESSENTIAL

Clean ballast is a definite requirement for the modern railroad operating at the increased speeds and under the heavier loads of today's traffic. Roadbeds must be free from cinders and other fouling agents to maintain drainage necessary for good line and surface.

To keep their roadbeds in the best of condition, maintenance officers of 28 railroads are utilizing 257 McWilliams "Mole" Ballast Cleaners. They have found that the "Mole" cleans ballast speedily—cleans ballast economically.



McWILLIAMS "MOLE" BALLAST  
CLEANERS are available in  
Border and Intertrack Models

MEMBER



**RAILWAY MAINTENANCE CORP.**  
**PITTSBURGH 30, PENNSYLVANIA**

Write today  
for complete  
information

# "....AND BE SURE TO PUT PARCEL LOCKERS HERE, TOO!"



WHEREVER men gather today to plan important changes or entirely new station or terminal buildings they are alert to the imperative requirements of the modern traveler . . . Convenience, safety, comfort, speed and service of the ultra-modern kind. . . . A whole new generation of travelers has come into the scene in the past few years . . . multiplied many fold during the war. Today's travelers are definitely travel-wise.

## LOCKERS ESSENTIAL

Today travelers look *first* for lockers. They regard lockers as *essential* to their convenience, to the safety of their luggage, to the speed with which they can make connections. With parcel lockers at their service they avoid waiting in line...

*Locker location* has become an almost exact science. Lockers properly located divert traffic

in to quick moving separate lanes. Concourse congestion is cut down. The public and the transportation company both benefit in many ways when modern, streamlined parcel checking lockers are specified in plans for renovation or new building.



{ Our consultants will gladly confer with you on the problems of locker location and installation, and will make surveys and recommendations without obligation }

**AMERICAN LOCKER COMPANY, Inc.**

211 CONGRESS ST., BOSTON 10, MASS.

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ATLANTA

NEW YORK  
CLEVELAND

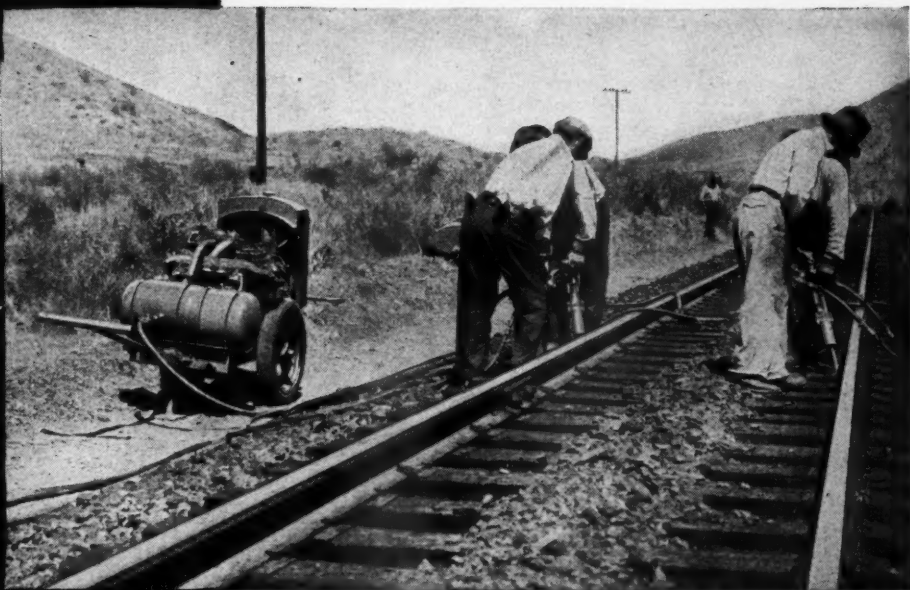
PHILADELPHIA  
CHICAGO DALLAS

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LOS ANGELES

**TOMORROW'S BLUEPRINTS WILL ALL INCLUDE PARCEL LOCKERS**

AT 60 TO 100 MILES  
PER HOUR

# TRACK MUST BE GOOD



**G**OOD TRACK MEANS UNIFORM TRACK WELL TAMPED. Section gangs with modern track equipment to aid them are doing an excellent job of maintaining good track.

The basic piece of equipment in a modern section gang is, of course, the compressor that supplies compressed air to operate the lightweight, powerful — Tie Tampers, Spike Drivers, Track Wrenches, Grinders, Riveters, Wood-Borers, etc.

One of the most popular mobile air compressor units is the DR-60 Spot Tamper, a 60 cubic foot machine that will operate four MT-3 tie tampers.

- Equipped with either wheels or rollers.
- For use either "off-track" or "on-track".
- Only 32 inches over-all width.
- Easily moved to next location.
- Two-stage air-cooled compressor.
- Push button starting.
- Cover for locking.
- Front and rear handle bars.

Ingersoll-Rand engineers will gladly assist you in selecting the proper pneumatic equipment for your mechanized section gangs. Send for a copy of our booklet, "Air Tools and Compressors for Railroad Maintenance of Way," Form 2712.

## Ingersoll-Rand

11 Broadway, New York 4, N. Y.

MEMBER



11-416

ORIGINATOR OF MECHANICAL TAMPING

# PLYWOOD rides the rails!



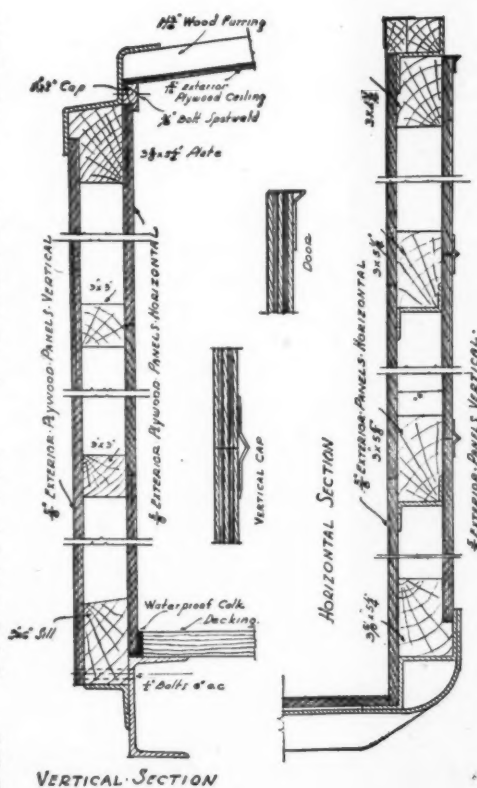
## Another Application proving the Durability of Douglas Fir Plywood

Many railroad car builders have used durable Douglas fir plywood for the ceiling and inside lining of freight cars, cabooses and baggage cars—and for complete refrigerator cars.

The Great Northern Railway is the latest to select Douglas fir plywood to do a really tough job. A schedule of 1,000 boxcars, built at the Great Northern's St. Cloud shops, utilized plywood for all outside and inside sheathing, including the ceiling.

Exterior type Douglas fir plywood (made with permanently waterproofed binder) was used throughout the new cars. Outside panels, installed vertically, are  $\frac{5}{8}$ " thick. Inside panels, installed horizontally, are  $\frac{5}{8}$ " thick. Ceiling panels are of  $\frac{5}{16}$ " plywood. Detailed structural sections are shown at the right.

The plywood cars, built with special steel frame and wheel carriages, average two tons



lighter than conventional cars. Production schedules called for the completion of six per day. The fact that Douglas fir plywood proves itself ideally suited to such rigorous service demonstrates again that this "miracle wood" is one of your most versatile building materials for every type of structural use. Douglas Fir Plywood Association engineers will gladly answer any query concerning plywood's application to construction work of any kind.

Douglas fir plywood is now available only on highest priorities. Application for allocation must be made by suppliers to the War Production Board.



**DOUGLAS FIR PLYWOOD ASSOCIATION, Tacoma 2, Washington**



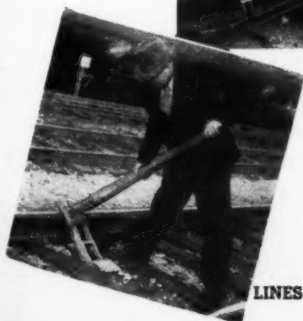
**ONE DOES IT!**



LIFTS RAIL



SPACES TIES



LINES TRACK

## ONE TOOL--ONE MAN

For Speed and economy in your track work, the One-Man Track Tool is your answer. The three readily interchangeable heads and the extra leverage secured from the long, sturdy, hardwood handle enable one man with this lightweight track tool to safely and quickly do work ordinarily requiring a gang of men. With the One-Man Track Tool one man can:

- Raise Rails
- Line Track
- Gauge Track
- Straighten Ties
- Space Ties
- Replace Ties
- Insert Shims or Tieplates
- Remove Shims or Tieplates

Write Today for our complete descriptive pamphlet to learn how your railroad can combat track labor shortage with the One-Man Track Tool.

# CARTIER SUPPLY COMPANY

400 West Madison Street

CHICAGO 6, ILLINOIS



**All over the Home Front**  
ON REPAIR AND MAINTENANCE WORK

**P & H**  
**HARMOMANG**  
A Proved Electrode For *high*  
Resistance to Impact, Abrasion and Wear

Harmomang is an electrode with the work-hardening qualities which suit it especially for the building up or hard surfacing of manganese and carbon steels.

It is a coated moly-manganese electrode with a hardness range up to 43-46 Rockwell "C". It can be used on AC, or for either straight or reverse polarity on DC.

Harmomang is the ideal electrode to use wherever you need protection against both impact and abrasion. For example: for hard sur-

facing dipper lips, dipper teeth, bucket runners, rock crushers, railway frogs or wherever longer life is desired for parts made of manganese or carbon steels.

Write direct for full information and procedures or see your P&H representative.

#### A COMPLETE ARC WELDING SERVICE

DC WELDERS



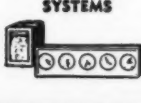
AC WELDERS



WELDING POSITIONERS



PRODUCTION CONTROL SYSTEMS



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**HARNISCHFEGER CORPORATION**  
WELDING ELECTRODES • MOTORS • HOISTS • P&H ELECTRIC CRANES • ARC WELDERS • EXCAVATING

Canadian Distribution: The Canadian Fairbanks-Morse Co., Ltd.



THE "TRIPLE THREAT"  
TO PLATFORM LIFE

DECAY  
WEAR  
TERMITES

are defied by **PRESSURE-TREATED WOOD**

If maintaining station platforms is one of your headaches, there's a proven remedy ready and waiting: use pressure-treated wood.

Proper pressure-treatment, as applied in Koppers Wood Preserving Division plants, gives long-time protection against decay. It improves wearing qualities, not only under the tread of countless feet, but also under the punishing move-

ment of heavy lading. It also repels Termites.

Furthermore, pressure-treatment greatly broadens the choice of woods available, and permits cheaper grades to be used. Some varieties of wood with excellent mechanical and service properties are short-lived in their natural state. Pressure-treatment makes them durable.

Station platforms are only one of dozens of places where pressure-treated wood is saving labor, time, money and trouble for users. Our bulletin, "Economical and Permanent Construction with Pressure-Treated Wood" illustrates and describes a number of applications, and also gives information about wood use, treating methods, and so on. Ask for a copy for your file.

**KOPPERS COMPANY • WOOD PRESERVING DIVISION**  
PITTSBURGH 19, PA.

**KOPPERS**

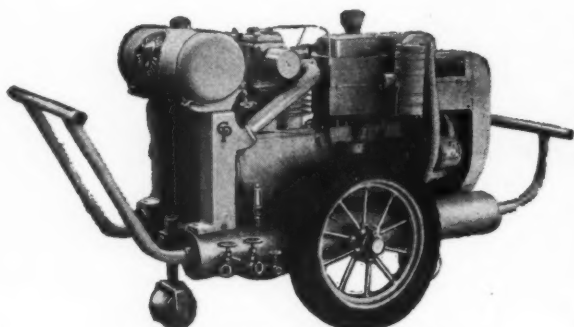
THE INDUSTRY THAT SERVES ALL INDUSTRY



# *Speed Up*

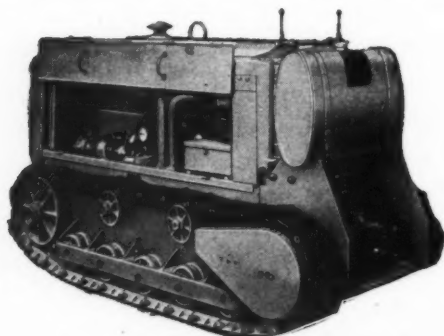
## TRACK AND BRIDGE REPAIRS with CP TIME-SAVING EQUIPMENT

Gasoline and Diesel-driven portable compressors, in a variety of railway mountings . . . easily handled, low air consumption tie tampers . . . speedy pneumatic wrenches . . . fast-working spike drivers and wood-borers . . . pneumatic and electric concrete vibrators — these are only a few of many items of time-saving CP Maintenance-of-Way Equipment. Write for further information on any of the equipment illustrated or listed in these pages.



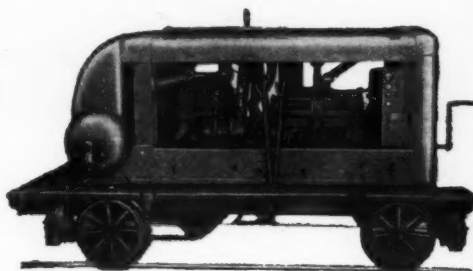
**CP PATROL COMPRESSOR**

Designed especially for spot tamping and track or bridge repair work; completely air-cooled for all year 'round service. Actual capacity, 60 c.f.m. at 100 pounds. Operates 4 CP Tie Tampers or any combination of tools of equivalent rating.



**CP CRAWLER COMPRESSOR**

Propels itself in either direction, travels between or across rails, turns around on its own center, will not tip over at a 45° angle. Sizes, 105 and 160 c.f.m., actual capacities; will operate eight or twelve CP Tie Tampers, respectively, or any combination of tools of equivalent rating.



**CP FLANGED-WHEEL COMPRESSORS**

CP Portable Compressors, self-propelled and non-self-propelled, are available in sizes of 105 to 500 c.f.m. actual capacities. Also furnished on skids and on steel or rubber-tired road wheels.



**CP TIE TAMPERS**

CP Tie Tampers are widely used because of their ease of handling and their low air consumption. Excellent for nipping and equally effective on jobs where the track is raised several inches.

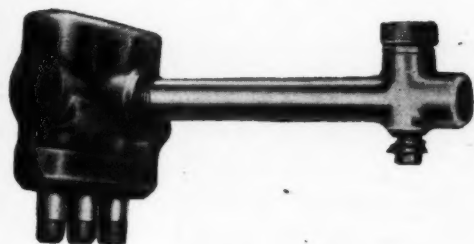




### CP PNEUMATIC WRENCHES

(Impact Type)

Ideal for assembling track fastenings, driving screw spikes and lag screws, applying or removing nuts, bolts, etc. There are 7 model CP Pneumatic Wrenches ranging up to 1 3/4" bolt size. Illustrated is CP 365-RP, capacity 1 1/4" bolt size.



### CP TRIPLE SCALER

Operating in unison at high speed, the small but powerful hammers of the CP 404 Triple Scaler cover three times the area of single piston tools.

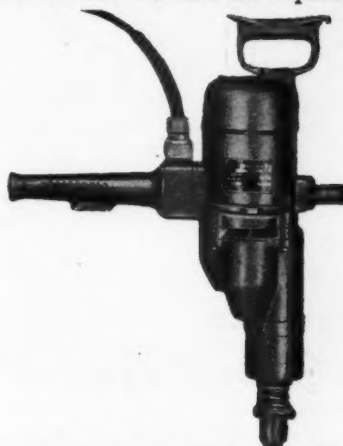
### OTHER CP MAINTENANCE-OF-WAY EQUIPMENT

In addition to the equipment illustrated, CP makes a wide range of pneumatic and electric drills, straight and angle grinders, concrete vibrators, and wood-borers; pneumatic single piston scaler, chippers, riveters, rivet busters, cement chippers, weld-flux chippers, paint scrapers, sump and sludge pumps, corner drills; sinker drills and demolition tools; also Universal hose and pipe couplings.



### CP CUT-SPIKE DRIVER

CP 117 Cut-Spike Driver is a powerful, easily handled tool. Finely balanced and easy to hold, has no back kick and does not require riding.



### CP UNIVERSAL ELECTRIC NUT RUNNER

CP 989-NC is an ideal electric nut runner for assembling track fastenings, tightening nuts and bolts in all types of maintenance service, particularly bridge and structural steel work. Reversible model of the CP 989-NC also available.

MEMBER

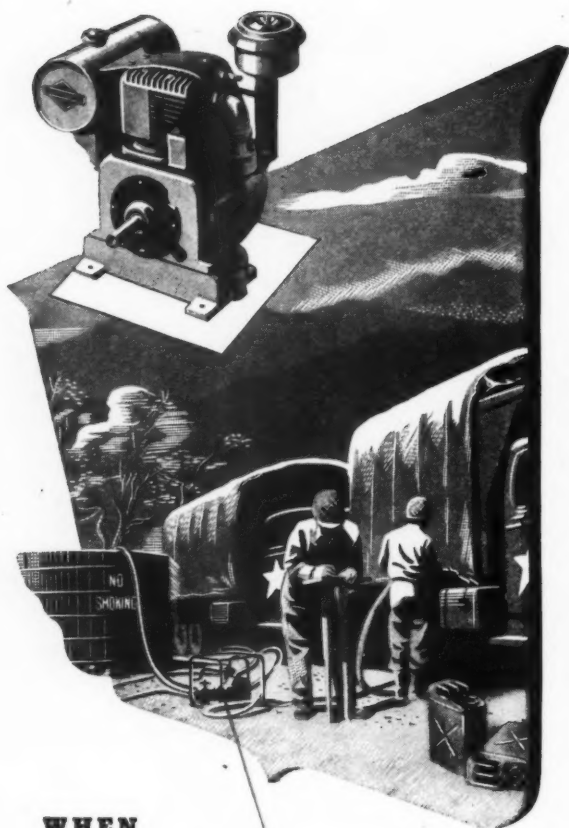


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PNEUMATIC TOOLS  
ELECTRIC TOOLS  
HYDRAULIC TOOLS  
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TOOL COMPANY

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AIR COMPRESSORS  
VACUUM PUMPS  
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**WHEN  
FUEL SYSTEMS  
NEED A *Stout "Heart"***

"Rush more gas."

That's the cry from all fronts.

To speed up pumping under all conditions, pumping units are powered by stout-hearted air-cooled gasoline engines — one more vital war application for dependable, instant-starting Briggs & Stratton engines.

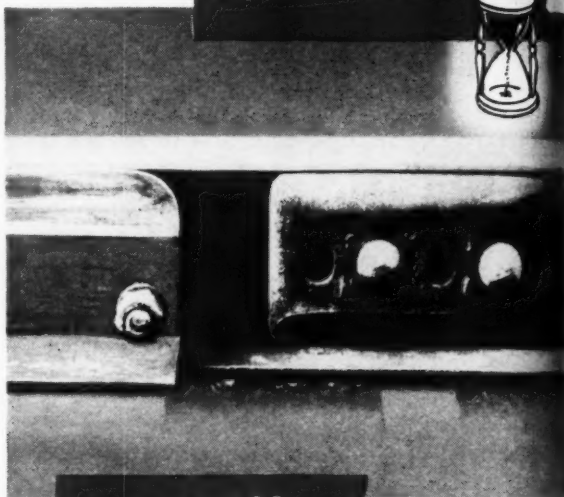
*Air-Cooled Power*



Manufacturers of all types of equipment requiring dependable, compact power units are invited to investigate the performance advantages of Briggs & Stratton engines. Their world-wide acceptance is backed by 25 years of leadership in design and precision manufacture—and the production of more than two million air-cooled gasoline engines. BRIGGS & STRATTON CORPORATION, Milwaukee 1, Wisconsin, U. S. A.





*Like an  
Hour Glass—  
Mack does it  
All Over Again!*



**MACK  
Reversible  
Switch Point  
Protector—**

**Extends Switch Rail Life  
8 to 10 times**

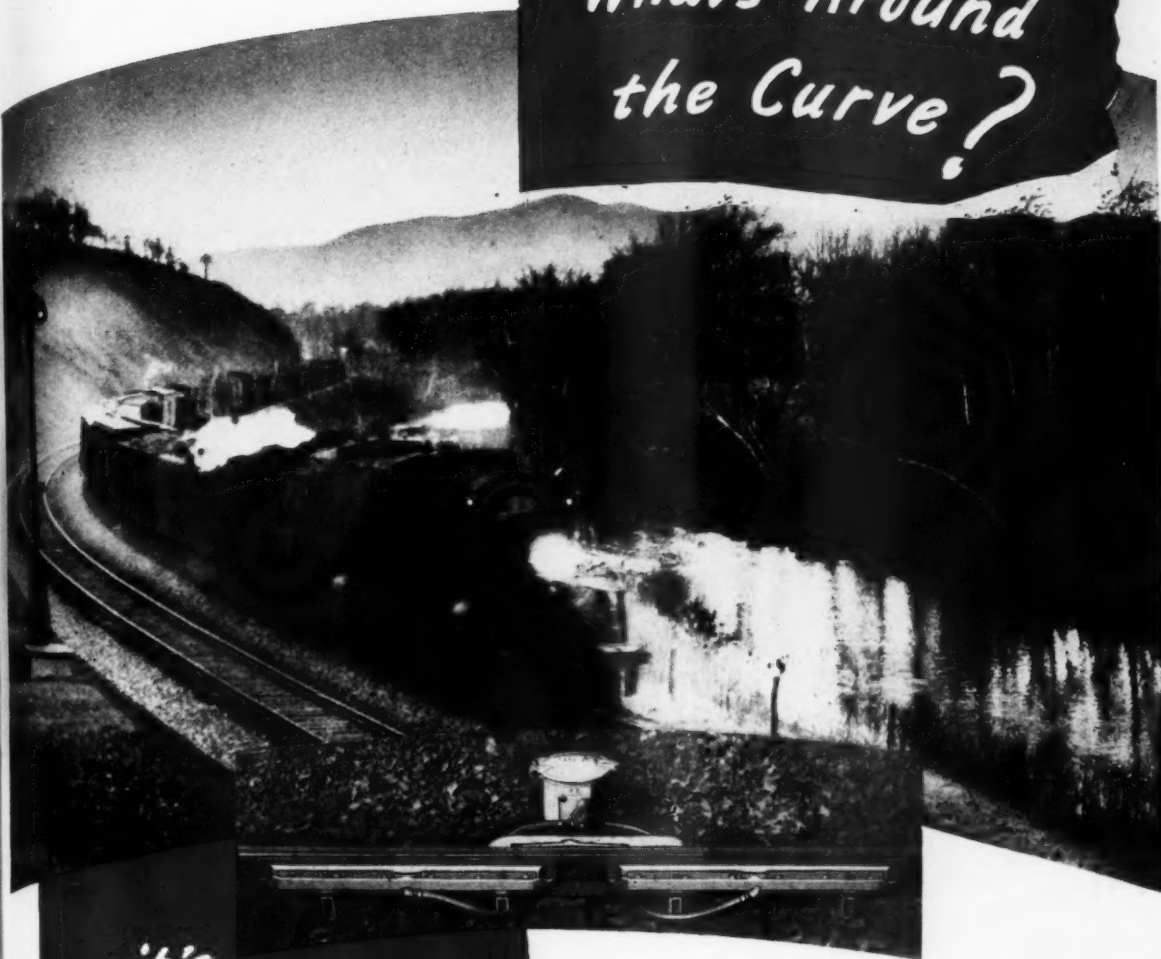
After the Mack Reversible Switch Point Protector has extended the ordinary life of the switch rail 4 or 5 times, it can be reversed, like an hour glass,  to do it all over again!

But unlike an hour glass,  its life is measured in months *before* it is reversed. Then it gives an additional life fully equal to the original.

**Maintenance Equipment Company**  
RAILWAY EXCHANGE BUILDING • CHICAGO, ILLINOIS

Railway Engineering and Maintenance

*What's Around  
the Curve?*

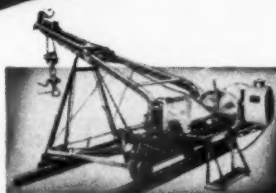


*it's  
MecoLubrication-  
and it's all around the Curve!*

Each MECO Lubricator Protects a Number of Curves

There's no mystery about MecoLubrication! You **KNOW** Mecos reduce curve rail replacements by prolonging the life of present rail in curves 2 to 4 times . . . then stay on the job to reduce *new* curve rail wear, too.

**Maintenance Equipment Company**  
RAILWAY EXCHANGE BUILDING • CHICAGO, ILLINOIS



Power Rail Layer Requires  
No Train Orders



Mack Reversible Switch Point Protectors  
Make switch rails last 8 to 10 times longer

# FOR SAFETY - IT'S Morden

## SECURITY ADJUSTABLE RAIL BRACE

IN SERVICE ON MAJOR RAILROADS SINCE 1920

**T**HE improved Morden Security Brace is specially designed to meet the needs of wartime traffic by providing adequate support for rails subjected to the thrust of heavy wheel loads. The Brace is adapted particularly for use in split switches and slip switches in interlocked territory where it is essential to hold stock rails to proper gage and alinement.

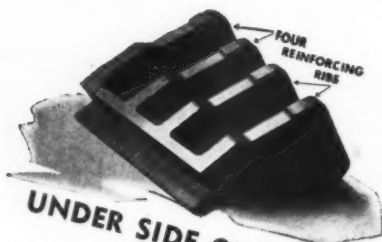
Simple in design, the Brace can be quickly installed, adjusted or removed, without disturbing either rail, tie, or plate. Rigorous loading tests have shown that the Security Brace will support a weight of 50,000 lbs. at a 45 deg. angle, with a spread of only  $\frac{1}{8}$  in., and a spread of only one inch when this weight is raised to 200,000 lbs.



COMPLETE BRACE ASSEMBLY



INDIVIDUAL PARTS OF BRACE



Four reinforcing vertical ribs, which extend from rail web to floor of brace plate, afford the greatest possible structural strength to the design.

UNDER SIDE OF BRACE

For more than 60 years Morden has pioneered in the construction of frogs, switches, crossings, guard rails, gage rods, rail braces and security track work. Let our engineers help you solve your track maintenance problems.

MEMBER



## SECURITY SPLIT SWITCH

**DESIGNED** and built to conform to either A.R.E.A. or customer's specifications, the complete assembly of the Morden Security Split Switch combines the Samson Heavy Duty Switch Point and the Betts switch plate. These details are designed to assure safe operation and promote substantial reductions in maintenance costs.

Braced with a Morden Security Adjustable Rail Brace, additional protection is afforded against the shocks of heavy traffic.

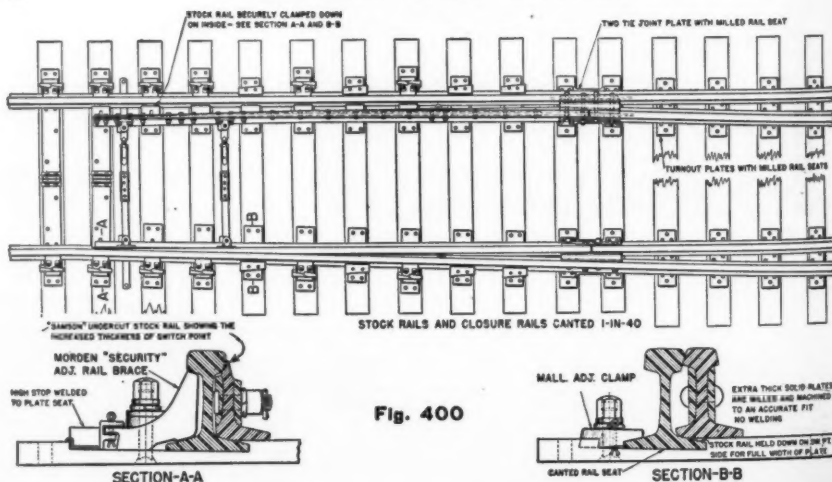


Fig. 400

# Morden Frog and Crossing Works CHICAGO, ILL.

Representatives in: CLEVELAND, OHIO; NEW ORLEANS, LA.; LOUISVILLE, KY.; ST. LOUIS, MO.; WASHINGTON, D. C.





## RACOR RAIL LUBRICATORS

### *Extend the Life of Wheels and Rail*

It has been proved, by extensive tests, that the automatic method of lubricating curves with the Racor Rail Lubricator is quickly paid for from savings made by extending the life of wheels and rails through its use.

Further savings are obtained by reduction of inspection and maintenance to a minimum. This is

due to the simple design and rugged construction of the Lubricator.

Installations made at the start of a curve will provide protection for 360° of included angle curvature, as car wheels carry the lubricant without appreciable waste to the points where it is needed.

#### RAMAPO, AJAX DIVISION

230 PARK AVENUE, NEW YORK

HILLBURN, N. Y.	EAST ST. LOUIS, ILL.	LOS ANGELES, CAL.
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CHICAGO, ILL.	SUPERIOR, WIS.	NIAGARA FALLS, ONTARIO

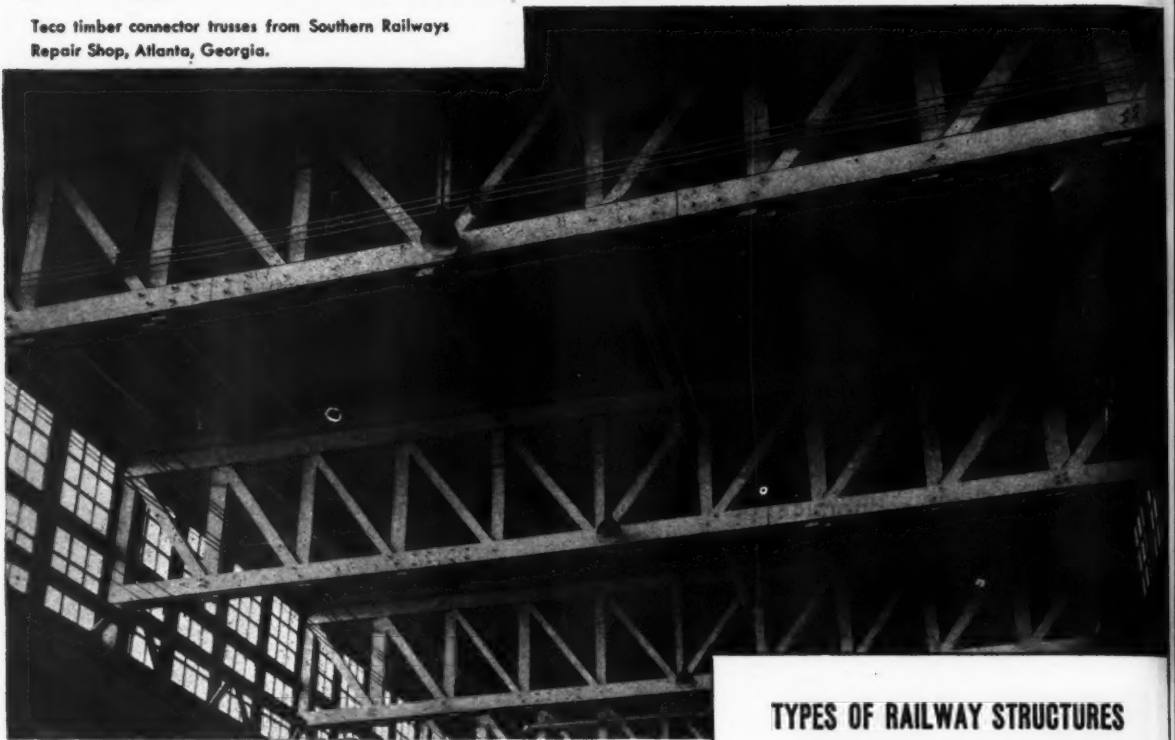
AMERICAN

## Brake Shoe

COMPANY

3803

Teco timber connector trusses from Southern Railways  
Repair Shop, Atlanta, Georgia.



## *In the YARD* *or on the ROAD*

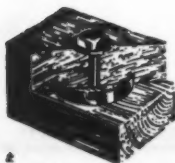
### Teco Connectors Make Stronger Timber Structures

Wherever heavy duty timber is used, connections can be made stronger, to last longer, with TECO connectors. Maintenance cost, too, will be less.

More than seventy railroads specify TECO connectors for their timber structures because design officials, architects, engineers and maintenance men have

all proved by actual experience that the TECO system of timber construction is ideal for hundreds of railroad purposes—in the yard or on the right of way. Write for free literature.

**TIMBER ENGINEERING COMPANY, INC. of WASHINGTON, D. C.**  
WASHINGTON • CHICAGO • MINNEAPOLIS • NEW ORLEANS • SAN FRANCISCO



*Specify* **TECO**  
**CONNECTORS AND TOOLS**

Endorsed by Leading Lumber Manufacturers and Fabricators

#### TYPES OF RAILWAY STRUCTURES USING TECO TIMBER CONNECTORS

- |  |   |
|--|---|
| 1. Roof Trusses                            | 9. Sway Bracing                           |
| 2. Overhead Cranes                         | 10. Coal Pockets                          |
| 3. Timber Bents                            | 11. Auto Loading Dock                     |
| 4. Connections between pile heads and caps | 12. Between Rail Post and Tie Connections |
| 5. Trestles                                | 13. Bridge Decks                          |
| 6. Ballast deck stub piles                 | 14. Scaffolding                           |
| 7. Piers                                   | 15. Coaling Towers                        |
| 8. Pier Fenders                            | 16. Warehouses                            |

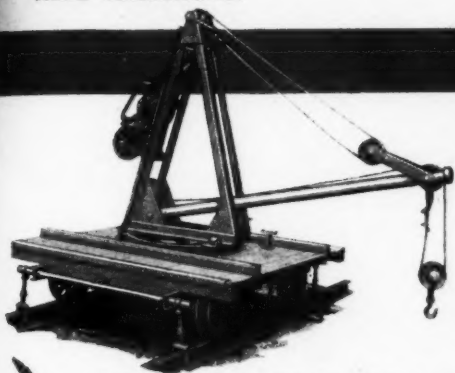
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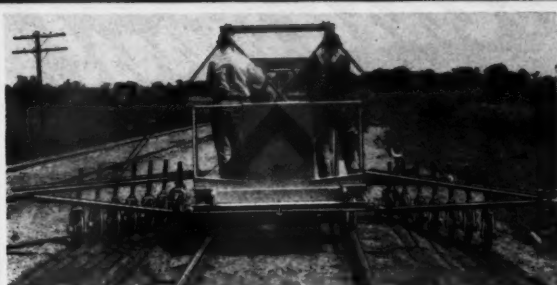
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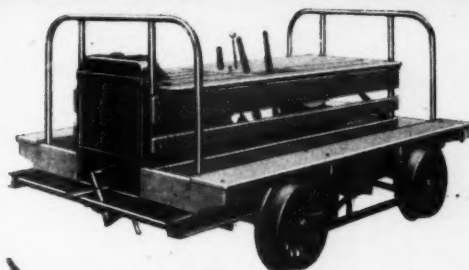
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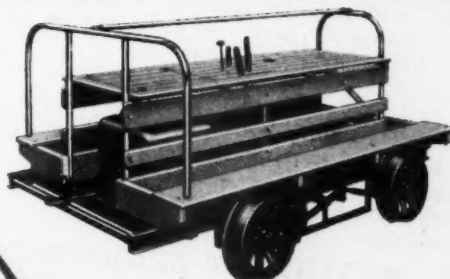
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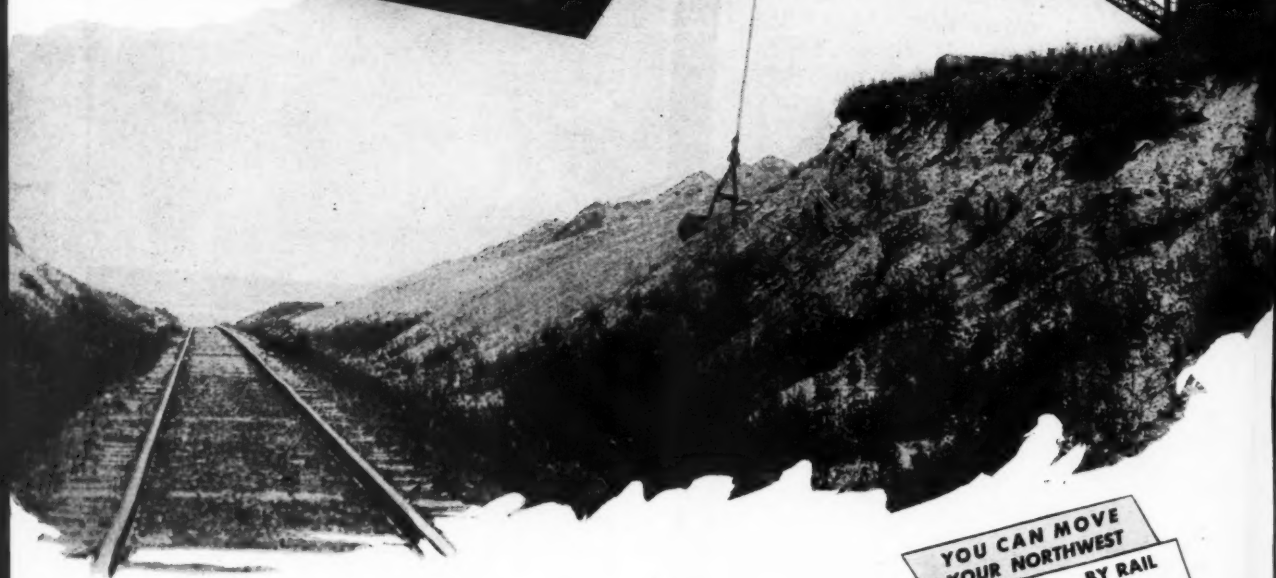


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No. 190 of a Series

# Railway Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 WEST ADAMS ST.  
CHICAGO, ILL.

Subject: Carrying On

October 1, 1944

Dear Reader:

Beginning with this issue, you have a new editor of your magazine. As a result of the sudden and untimely death of Elmer T. Howson, editor of this publication since its beginning in 1916, the mantle of one you have known and admired so long now rests heavily on my shoulders—a challenge to carry on—from both you and my predecessor, which I accept with a deep sense of humility and responsibility.

For many years you have looked to Railway Engineering and Maintenance under the guidance of Mr. Howson for knowledge, help and encouragement in carrying out your many varied and difficult tasks. That you have found all three of these in our publication has been evidenced by your many letters and words of commendation in the past, and is evidenced anew in the many tributes to Mr. Howson's memory which have been received, extracts from a few of which are published in this issue.

To carry on successfully the policies, aims and ambitions of one so capable and informed in railway matters is a task of no small magnitude. Indeed, it would be a hopeless task if it were not for three considerations—first, the twenty years of intimate association which I enjoyed with Mr. Howson, both in the East and in the West, always observing, always learning, always emulating him in the best interests of the railway field, and especially the interests of railway engineering and maintenance officers; second, the loyal co-operation of you men in the field, which I cherish, and without which I am keenly aware we would have failed in the past, and cannot hope to succeed in the future; and third, the knowledge that I have the support and backing of an able, experienced and conscientious staff, including Merwin H. Dick, who leaves New York to become managing editor in Chicago; John S. Vreeland, who leaves his post in Chicago to succeed Merwin Dick as Eastern Editor; Harry E. Meason, who is in charge of News and printshop editorial make-up; and George E. Boyd, associate editor, who is the dean of us all in years and experience.

These are the three considerations upon which I base confidence that Railway Engineering and Maintenance will carry on, and of these considerations, the most important is the continued co-operation of you, our readers, that through your help, we may be able to bring to you all the interesting, timely and helpful information which you desire in your work. I speak for our entire staff when I promise you our maximum effort in your behalf; and I know that I speak for each one on our staff also when I say that we hope that we may continue to merit the confidence and co-operation which you have so generously given to us in the past.

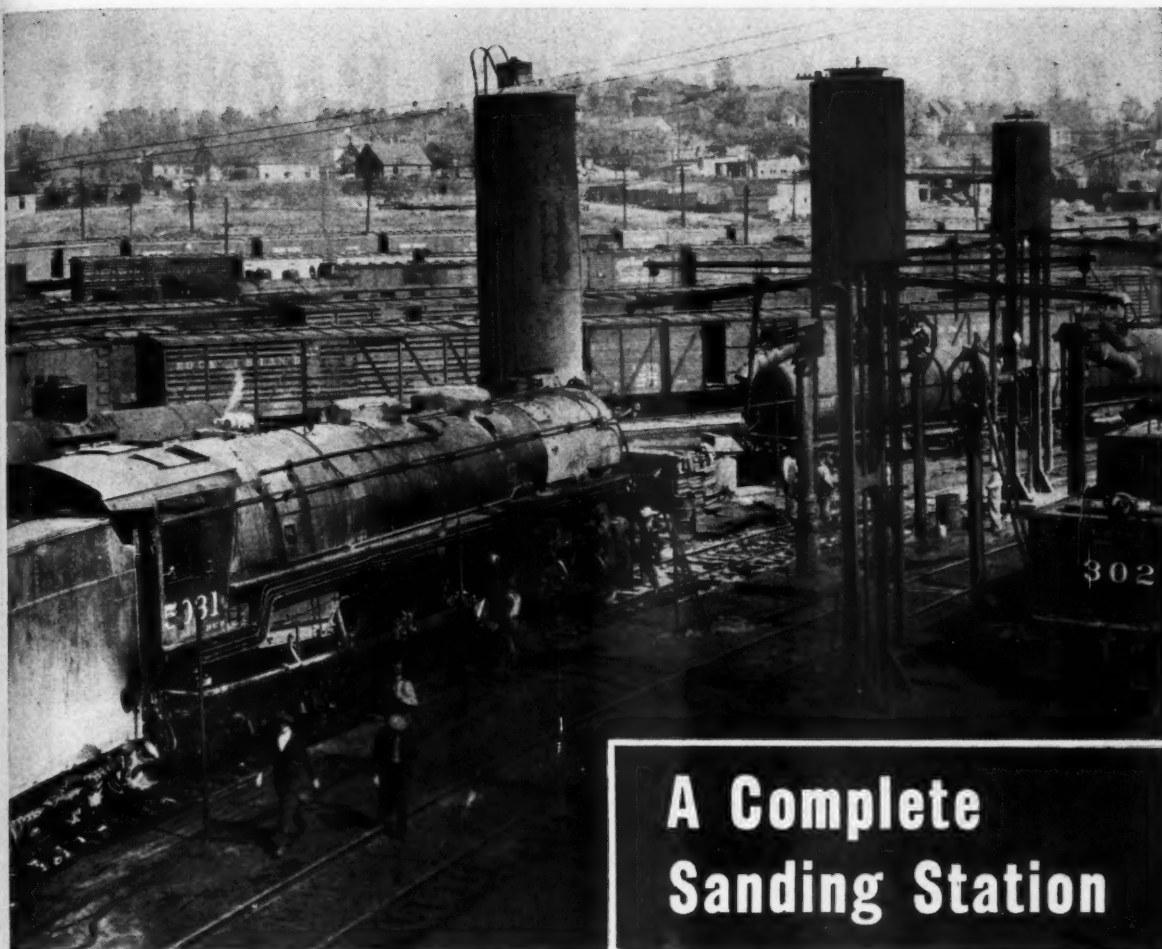
Yours sincerely,

*Neal D. Howard*

NDH:ag

Editor

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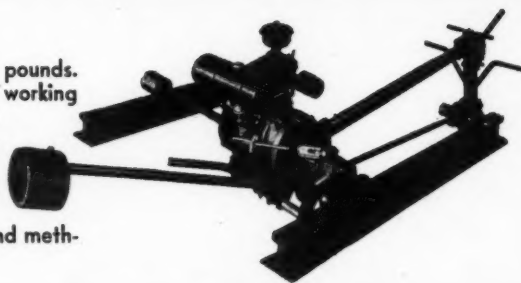
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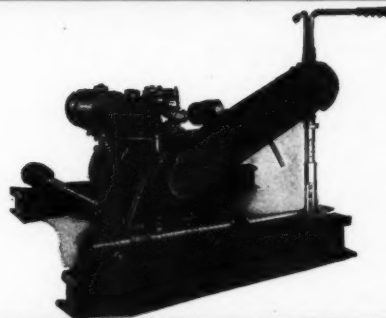


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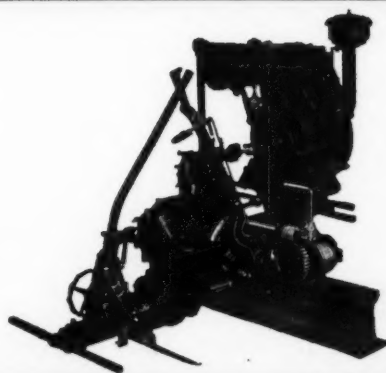
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# Railway Engineering and Maintenance

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**Roadmasters Sections** - - - - - 907

Presents report on Executive committee meeting in Chicago on September 20, together with reports and discussions on the following subjects:

Operation and Maintenance of Work Equipment

Effect of Traffic on the Service Life of Ties—and Methods of Protection

Prevention of Accidents to Trackmen

Mechanization of Section Gangs

What the Trackman Can Do to Speed Up Train Operation

Recruiting Men in the Face of a Labor Shortage

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Reviews the activities of the association in past years and contains a message from President H. C. Hickey and Secretary Lewis Thomas

**Maintaining Deep Well Pumps** - - - - - 930

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NEAL D. HOWARD

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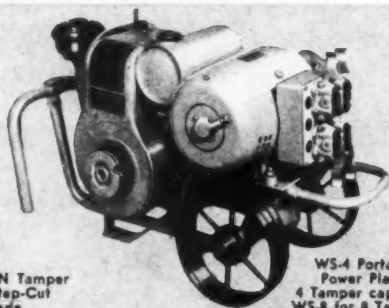
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# Railway Engineering and Maintenance

## Reconversion—

### No Serious Problem for the Railways

While many war industries over the country, normally engaged in peacetime pursuits, are seriously concerned about reconversion to civilian production as the war in Europe draws to a close, and not without some justification, it is a significant fact that one of the largest and most important of all of the war industries of the country—the railroads—are certain to be almost entirely free of this difficult problem. This is a fortunate situation, the importance of which, to the public, to the railways themselves, to their employees, and to those who supply the railways with equipment and materials, has possibly been overlooked or underestimated in some quarters.

Reconversion in many industries, no matter how gradual, will, of necessity, require retooling, reorganizing, and, temporarily at least, curtailed production and reduced employment. In fact, for certain industries, difficult, if not chaotic, conditions for both management and employees are foreseen for a considerable period. For some other industries, wise government cut-backs and skillful planning within the industries themselves will make the shock less severe, but for the railroads, except for a revision downward of war traffic demands and present intensive schedules, it will be largely a question of consolidating their gains and experiences of the war years, and of starting out headlong in the race to maintain pre-eminence in the field of mass transportation.

Unlike many other industries, including the automobile and the bus and truck industries, the railways will not have to take a step backward before they can go forward. It is true that they will need to undertake vast programs of rehabilitation in the post-war period—that conventional passenger train equipment must give way to modern, lightweight, streamlined, air-conditioned equipment; that the excessive weight of many freight cars must give way to lighter cars of more durable materials; and that the greatest efficiency will need to be sought in motive power.

It is likewise true that faster post-war train schedules will require vast programs of roadbed and track rehabilitation, with generally higher standards of maintenance, together with extensive programs of building repairs and modernization, especially in connection with passenger stations. But in all of this the railroads can go forward without stopping a wheel, without disrupting a plan, and without disorganizing a single maintenance of way department gang. In fact, rather than disrupt their present efforts and operations, the gradual relief from the war-time overload they have been carrying, combined with the increased availability of the many materials they will need for essential replacements and improvements in both equipment and roadway, will make it possible for the railways to forge ahead with their plans—and they have plans—extensive plans—to maintain their place in the post-war transportation picture.

That this is the situation in prospect for the railways augurs well for them and the country. It augurs well also for industry generally, and especially for the railway supply industry, to which the railways must look for vast quantities of materials, supplies and equipment. In addition, it augurs well for every loyal railroad employee, including every employee in the maintenance of way department who is willing to carry on in the new order. In no other industry is there greater justification for confidence in the post-war period, if the railways carry through with their plans resolutely, and if every employee does his part.



## Post-War Planning—

### Efficiency Must Reach New Heights

AS the end of the war draws closer, maintenance men are becoming increasingly pre-occupied with thoughts of the future, with special reference to the post-war outlook for them and the work of their departments. To some extent such thinking is circumscribed by the uncertainties in the situation, and for this reason there is a tendency in some quarters to defer definite planning until the future trend of events is more clearly revealed. This, however, may not be the best policy.

Admittedly, many uncertainties will become apparent in any attempt to appraise the future, but at the same time, there are also certain truisms that will prevail regardless of other events. One of these is that post-war traffic and service demands will require that the tracks and structures of the railroads be maintained to a higher standard than ever before. Another is the imperative need that will prevail to keep expenditures for maintenance work at the lowest possible level.

In achieving these two post-war requirements, namely, a higher standard of maintenance with a minimum outlay, one of the most important factors to be considered is the output of work per man-hour expended. It is a well-known fact that the over-all man-hour output in maintenance work has declined during the war years. The reasons for this are equally well-known, and need no discussion here. However, when peace returns, there appears to be no reason why, with adequate planning and supervision, the ground lost in the amount of work done per man-hour because of war-time conditions cannot be largely regained. But even if this is done, it seems certain that there will be one additional factor in the situation—hourly wage rates are likely to remain at a higher level than before the war.

If we assume for the purposes of this discussion that the funds to be made available for maintenance work after the war will approximate the expenditures for similar work in the immediate pre-war years, the effect of present higher wage rates will obviously be to reduce the number of man-hours of labor that can be applied to the maintenance of the tracks and structures, unless offset by some other factor or factors. This problem of making up for a loss in the productiveness of the labor dollar is one, the solution of which will require a high order of skill, ingenuity and application.

Among other things, the task will entail careful scrutiny of methods and organizations for the purpose of making any improvements that give promise of leading to increased efficiency. This includes, of course, the possibilities inherent in the wider use of power tools and equipment, both for those tasks that are already mechanized and for those that have not yet yielded fully to mechanization. In the attack on this phase of the problem, the manufacturers of power tools and machines can render invaluable aid by effecting improvements in existing units and by developing new ones for work that is still being done by hand. Another possibility for getting more work done per man-hour is to take steps to reduce delays occasioned by passing traffic, perhaps through the use of more off-track equipment or by working out schemes to obtain the use of the track on a wider scale than is now generally possible.

It is not as though maintenance department officers have overlooked these considerations in the past, and have not always striven for maximum efficiency in carrying on their activities, because most of them have. However, in looking forward to the post-war period, the only safe course for them to pursue is to assume that in that period it will be more necessary than ever before to stretch the maintenance dollar to the limit of its effectiveness—and it is not too early to begin making plans in that direction.

## Rail—

### Must Adopt Every Means to Avoid Damaging It

IMPORTANT as it has always been for track maintenance officers to take care of their rail in the interest of safety and maximum service life, there never was a time when this was more important than it is today. This is true, first, because of the excessive wear and abuse to which much of the rail of the country has been subjected by the peak war traffic of recent years at generally higher speeds. It is true also because of the inadequacy of rail replacements in recent years, which has increased the average life of rail in track; and it is true because of the inability, due to labor shortages, to take the best care of both old and new rail in service by adequate programs of general track maintenance, such as ballasting, ballast cleaning, surfacing, tie renewals, etc., which have such an important influence on the life of rail. And the need to continue to take care of their rail takes on added importance at the present time in the light of the recent announcement of the War Production Board that new replacement rail deliveries in the fourth quarter of this year will be cut from the requested 550,000 tons to 360,000 tons.

There are many factors entering into the life of rail over which the track maintenance officer has little control today, especially when he can not secure the necessary labor and materials to strengthen his track generally and to keep it to the highest degree of alignment and surface. But there are many things that he can do, and among them is to see that his rail is not damaged by the carelessness or ignorance of his track forces, either while being laid, or after it is in the track.

One of the practices all too common among trackmen, in spite of long-standing rules or special instructions to the contrary, is the striking of rails with spike mauls to move them inward or outward during gaging and shimming operations; to jar them loose when adjusting expansion; and to free them from dirt, ice and snow as they are picked up and are about to be set in the track. Experienced trackmen have long known that it is improper to strike the base of a rail with a spike maul or any other heavy object, but many of them will admit that they have had little concern about striking the web of the rail. This fallacy must be corrected, because it has been demonstrated that equally severe damage can be done to a rail by blows on its web, even to the point of fracture, especially when the rail is at low winter temperatures.

Obviously, to avoid any unnecessary abuse or damage to rails, the only safe course to pursue is to insist that



they never be struck with a spike maul for any purpose, and regardless of the temperature. Especially in the light of the present rail situation, nothing short of positive measures should be taken to insure that every man on the track understands this. This is particularly important today when some roads are being called upon to lay rail during the winter months, and when so many inexperienced men are being employed on the track.

## Neatness—

### Implies Other Desirable Qualities

IT is an oft-repeated observation that the good housekeeper is a better workman than one who is untidy. It has also been said sometimes that the quality of the track maintenance on a section can be predicted with a fair degree of accuracy by observing the condition of the section tool house. Whatever truth there may be in these observations applies with even greater force to the operation of power machines.

Every officer who is interested in the operation and maintenance of work equipment is aware that the operator who keeps his machine spick and span invariably has a machine that is in better condition than the operator whose machine is untidy and slovenly. Neatness, of itself, tends to prolong the life of a machine, because it offers less opportunity for dirt and grit to work into the bearings and wear or damage the parts. Furthermore, an accumulation of dirt, generally mixed with oil or grease, may hide evidence that a part is failing and thus prevent detection of the defect until complete failure has occurred.

An operator who takes enough pride in his machine to keep it neat and clean, must go over it periodically to remove accumulations of grease and dirt, and in doing so he will inspect the parts and can thus detect defects and incipient failures far enough in advance to arrange for renewal of the defective or damaged parts before actual failure occurs. It is almost an axiom also that the operator who takes enough interest in his machine to keep it clean, will also care for it in other ways that will conserve service life, such care will also avoid costly delays to the operations of the gang with which he is working, by eliminating many stoppages to make repairs and adjustments.

For these and other reasons, work-equipment maintainers, supervisors and other officers who have contact with the operators of power machines, should make it a point to impress upon them the importance of cleanliness and frequent, thorough inspection, as well as care and judgment in handling the machines. This feature of supervision is so important normally and so urgent at this time that the officer who neglects to maintain steady pressure, where needed, to insure neatness and care of the various units he is working, is not doing his full duty.

While dependability and infrequent necessity for repairs are important normally, men are too scarce today to tolerate any condition that will cause interruption to work in which they may be engaged. Because many experienced and well-qualified operators of work equip-

ment are in military service or have left for other employment, it has been necessary to train many new operators in recent months. If they have not been educated to neatness and good care of their machines, as well as careful operation, their training has been neglected in important particulars.

## Ties—

### Can They Be Made To Go as Far as Needed?

OWING to the shortage of ties for next year's renewals, which is becoming more evident as time goes on, some adjustments in the normal methods of making tie renewals will be necessary in 1945 if best results in safe, smooth-riding track are to be assured. During the depression years, tie renewals did not always keep pace with tie failures. However, in the interest of safety to trains, this was overcome to some extent by using ties somewhat more freely in main tracks, and by restricting their use in secondary, yard and industrial tracks. Although it is possible to repeat this action in the light of the conditions developing, it does not follow that it is desirable to do so. In fact, every practical measure to prolong the life of existing ties in service should be taken before resorting to this practice.

One of the first and most important things to do in such a situation is to bring to the attention of all roadmasters and track supervisors the necessity for the curtailment of their tie programs, and to make it plain that only so many ties will be available, so that when these have been inserted, the season's renewals will have been completed. These men, in turn, should curb the over-ambitious foreman who is likely to use up all of his tie allotment in the first track worked, and then find himself short of ties for renewals elsewhere.

Some stretches of track will need to be re-examined in the light of the restrictions that are certain to be imposed in 1945, and a new schedule of tie distribution may be necessary. Once having settled on the most desirable allotment for each territory, the distribution should be controlled closely and made without deviation to insure a uniform condition for sections and districts. Additional rail anchorage will often be of real assistance where tie renewals are below needs.

In addition to the foregoing consideration, every practicable measure should be taken to extend the life of ties in the track, especially those that have little service remaining in them. Under ordinary conditions it is customary, when giving the track a general raise, to remove all ties that will not last more than two or three years. Normally, it is not only economical, but desirable, to do this, to avoid the necessity for disturbing the track until at least the third year. Today, only ties that will not last more than one year should be removed.

Keeping in mind that the necessity for seasoning before treatment will restrict the number of ties available for renewals in 1945 to approximately the stock on hand by the railways or already in the yards of the producers, the above considerations should not be overlooked. In fact, the equitable distribution of the ties available is of such importance that it is not too early to start now to plan how this can be done effectively.

# Railway and Supply Men Pay Tribute To Elmer T. Howson

Letters from a wide range of friends and associates all speak of the great loss sustained by the railway field

EVEN as this issue goes to press, letters from railway officers, from railway supply officers, and from others close to the railway and publishing fields, continue to be received lamenting the untimely death, on September 1, of Elmer T. Howson, for more than 28 years editor of *Railway Engineering and Maintenance*, and eulogizing him as an outstanding leader in these fields. Following are excerpts from some of these letters of sympathy and tribute.

"It was with sincere sorrow that I heard of the passing of Elmer Howson. He was a fine Christian gentleman and business executive, and one who can be illy spared in these stirring times."—*R. H. Aishton, formerly president of the Chicago & North Western, and later president of the American Railway Association and chairman of the Association of Railway Executives.*

"Mr. Howson's death is a great personal loss to me and to the American Railway Engineering Association, for, as you know, he has been a tower of strength through the years, and has impressed himself on the work of the Association by untiring efforts and wise counsel."—*F. R. Layng, Pres., American Railway Engineering Association, Ch. Engr., Bessemer & Lake Erie.*

"Deeply shocked and grieved to learn of Elmer's death. It is not only a great loss to you but to the railroad world, especially its engineers."—*R. E. Dougherty, Vice-Pres., New York Central Lines.*

"I have known Mr. Howson for many years; was closely associated with him on work when I was active in the American Railway Engineering Association, and during the last few years worked with him on certain committees and discussed many current problems. I admired and respected him, his energy and ability, and he will be greatly missed by his friends, as well as by the vast acquaintanceship he had in the United States."—*W. D. Faucette, Exec. Rep., Seaboard Air Line.*

"Elmer and I were closely associated in a great many activities during the years of our friendship, and his courage, intelligence and honesty were always an inspiration to me. He was, without doubt, the best friend we men in the crosstie industry ever had, and his keen interest and help will be sorely missed by all of us."—*John S. Penny, Pres., T. J. Moss Tie Co.*

"I feel a very deep sense of personal loss in Elmer's passing; we had been close friends over a period of many years and I valued his friendship very highly. In his passing, the engineering profession has lost an ardent worker for high professional standards, the technical

press one of its ablest writers and directors, and the American Railway Engineering Association, one of its best workers. He will be missed in every quarter."—*E. M. Hastings, Ch. Engr., R. F. & P., and Past-Pres., A. R. E. A.*

"I was deeply shocked to learn of Mr. Howson's death. His passing was untimely, and will be felt keenly by not only the railroad fraternity, but by myself as well."—*W. H. Hillis, Opr. Off., Chicago, Rock Island & Pacific.*

"I was proud to know Elmer and to count him as a very close friend and associate. His passing will leave a definite void among his many friends and is a distinct loss to the American railroads which he so gallantly championed throughout the years."—*Fred Schwinn, Asst. Ch. Engr., Missouri Pacific Lines.*

"He was a wonderful friend and associate, and his dynamic efforts to do good and substantial things will be remembered by all who ever knew him. His capacity and ability at work were an inspiration to many people, and I am among them."—*A. A. Miller, Ch. Engr., M. of W., Missouri Pacific.*

"I was terribly shocked and grieved to hear of the passing of Elmer Howson. I have known him for some years and have liked him very much indeed. He was a very capable man and always a gentleman."—*L. R. Capron, Vice-Pres., Burlington Lines.*

"It was a great shock to learn of the death of E. T. Howson. His was certainly a full life. I have never known anyone who gave more of himself to the tasks at hand than he. Instances are rare of men, who by their individual efforts, have left a distinct record of achievement in an industry. Howson was one of the few to claim this distinction."—*Carlile P. Winslow, Dir., United States Department of Agriculture, Forest Service, Forest Products Laboratory.*

"I am greatly shocked with the news of Mr. Howson's death. I considered him one of the best friends I ever had and one of the most capable men I ever knew in any line of work. I know there is always someone to take the place of a man who passes away, but the filling of Mr. Howson's shoes will be as hard a job as I ever knew anyone to undertake. To say that I am overwhelmed with sorrow is putting it mildly."—*George L. Sitton, Ch. Engr., M. W. & S., Southern.*

"He was ever alert to the welfare and best interests of the railroads and of such industries as ours associated

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# Roadmasters Section

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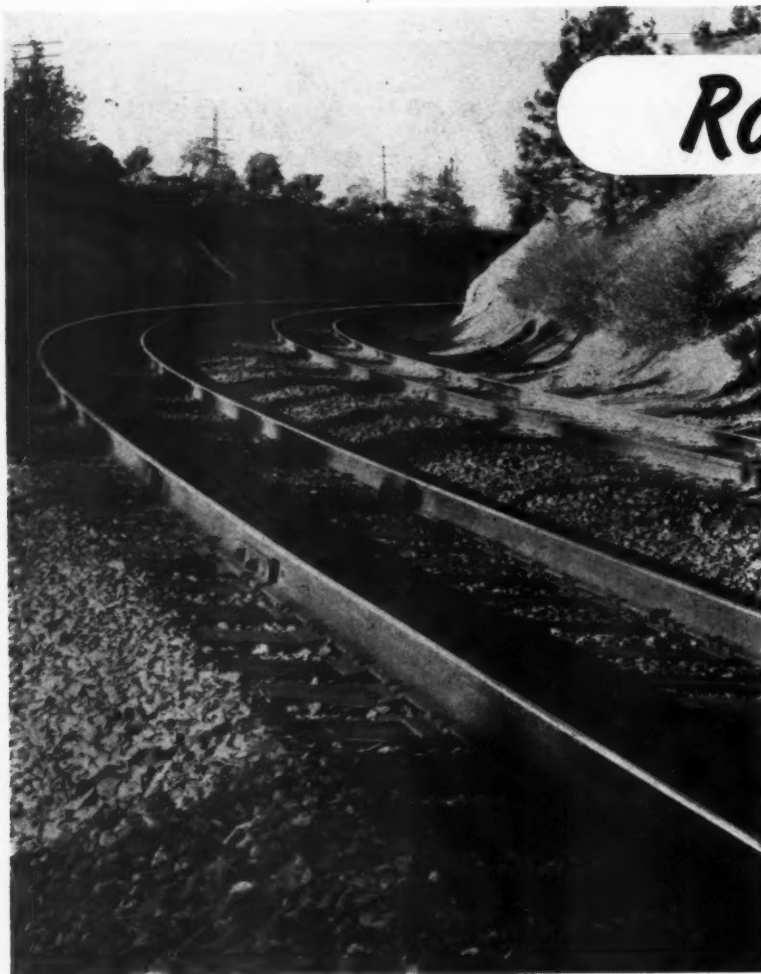
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Recruiting Men in the Face of a Labor Shortage





# Roadmasters Consider

This is a report of the meeting of the Executive committee of the Roadmasters' and Maintenance of Way Association in Chicago on September 20, called to act upon association matters in view of the necessary cancellation of the annual meeting again this year. In addition to the action taken at the meeting, it also presents, in full, all of the technical committee reports submitted, together with abstracts of the discussions following their presentation

Every Element of the Track Structure Must Be Watched Carefully Under Today's Heavy Traffic

FOR the second consecutive year, as the result of war conditions, the Roadmasters' and Maintenance of Way Association cancelled its annual meeting scheduled to be held in Chicago on September 19-21, and substituted a one-day meeting of its Executive committee. The meeting this year was held at the Hotel Stevens, Chicago, on September 20. Presided over by E. L. Banion, general track foreman on the staff of the assistant general manager of the Eastern Lines of the Santa Fe, the committee, aided by the chairmen of several of the technical committees of the association and a few members from the Chicago area, gave detailed consideration to six committee reports and to a number of special problems facing maintenance officers, and set up a constructive program of work for the year ahead.

In only four other years in the long history of the association, now more than sixty years old, has it failed to hold annual meetings, the other years in which no meetings

were held being 1931-1933, at the depth of the depression, and again last year. Of these years, failure to hold a meeting this year was probably felt more keenly than in any previous year, especially because of the exacting demands being made on the track structure by war traffic, and the difficult problems that continue to confront maintenance men as the result of deficiencies in materials, labor and work equipment. However, anxious to help set an example in the campaign of the railroads and the Office of Defense Transportation to discourage large group meetings of any kind, to ease the burden on already crowded passenger trains, and, not unmindful of the heavy responsibilities of its members in the field, there was little choice for the Executive committee but to defer the annual meeting this year. That their action in this regard was in order and was appreciated, is evidenced by the telegram received by the committee during its meeting, from Director J. Monroe

Johnson of the O.D.T., which said: "My salutations to the Executive committee of the Roadmasters' Association and, too, my thanks and appreciation of the work you have done that has enabled the railroads to amaze the nation, and for your co-operation in repeatedly cancelling your conventions."

## Tribute to Past-President Howson

Making the most of its highly condensed session, the Executive committee gave over practically the entire day to the presentation and discussion of the committee reports, the only major exceptions being a roundtable discussion, which developed late in the afternoon, and a pause earlier in the day to pay tribute to Elmer T. Howson, a past-president of the association and, until his death on September 1, editor of *Railway Engineering and Maintenance*. With deep feeling, both as a close personal friend of Mr. Howson, and as a close co-



# Carry On—

## Problems—War and Post-War

worker with him for many years in association work, H. R. Clarke, chief engineer of the Chicago, Burlington & Quincy, and himself a past-president of the association, led this period of tribute, in which Mr. Howson was eulogized for his ability, enthusiasm, driving energy and honesty, and for his steadfast and untiring efforts in the work of the Roadmasters' Association over a period of many years. Along with a high-light summary of Mr. Howson's career, Mr. Clarke said in part as follows:

"I doubt whether anyone is qualified to pay tribute adequately to the memory of Mr. Howson, and, in a group such as this, which has known him as we have known him, I think it is unnecessary. Each of us has paid tribute to him in his own mind and in conversations, times without number, since we received the sad news of his death on September 1. We cannot add luster to the record which he wrote so well and so consistently throughout the years.

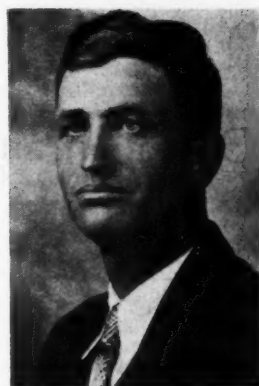
"Mr. Howson was active in many associations. I need not tell this group of his relationship with us. For many years he performed an outstanding service for the Roadmasters' and Maintenance of Way Association. For at least 23 years to my knowledge, he gave a great deal of time and thought to the building up of this association and to making it more effective in the field in which we work. He served as a member of the Executive committee, as vice-president and president, being president during the depression years when, for a period, it was not possible to carry on the usual annual meetings. It was due very largely to his outstanding leadership and to the influence which he had, that we were again able to resume active work when we did, and as effectively as we did.

"It is difficult to mention all of his characteristics and attributes.

We respected him for his ability, his enthusiasm, his driving energy, and for the things which he accomplished. We admired him for his honesty, his courage, his steadfast principles and fairness, and we loved him for his loyalty to his friends and to his ideals.

"The railroad industry has lost an outstanding leader at a time when it can ill afford that loss, and the community has lost a Christian gentleman."

Speaking too, from long intimate association with Mr. Howson, George E. Boyd, associate editor of *Railway Engineering and Maintenance*, told of the important influence for good which Mr. Howson long exercised on the affairs of the association, beginning in the years prior



E. L. Banion  
President

to 1915, when its activities and influence were at a comparatively low ebb. To a man, he expressed the feeling of all present when he said that the association had suffered an irreparable loss.

### Roadmasters' Association

#### Officers 1943-44

E. L. Banion, president, general track foreman, Eastern lines, A. T. & S. F., Topeka, Kan.

H. E. Kirby, first vice-president, assistant engineer, Chesapeake & Ohio, Richmond, Va.

J. M. Miller, second vice-president, superintendent, Western Maryland, Cumberland, Md.

Elinor V. Heffern, secretary, Chicago.

E. E. Crowley, treasurer, roadmaster, D. & H., Albany, N. Y.

#### Directors

E. J. Brown, engineer of track, C. B. & Q., Chicago.

S. J. Hale, assistant superintendent, N. & W., Roanoke, Va.

R. L. Fox, roadmaster, Sou., Alexandria, Va.

Ray Marshall, district roadmaster, G. N., Superior, Wis.

A. L. Kleine, division engineer, D. & R. G. W., Grand Junction, Colo.

F. J. Meyer, chief engineer, N. Y. O. & W., Middletown, N. Y.

A. B. Chaney, district engineer, M. P., Little Rock, Ark.

F. E. Schaumburg, roadmaster, C. & N. W., DeKalb, Ill.

### Nine Subjects Considered

The technical reports submitted to the meeting, which are presented on following pages, together with abstracts of the discussions which accompany them, dealt with the following subjects: The Mechanization of Section Gangs; Effect of Traffic on the Service Life of Ties—And Methods of Protection; What the Trackman Can Do to Speed Up Train Operation; Prevention of Accidents to Trackmen; Recruiting Men in the Face of a Labor Shortage; and the Operation and Maintenance of Work Equipment.

During the roundtable discussion, consideration was given to the following questions: What is the most economical size of gang for general ballasting work? What are the practical advantages of the heavy right-of-way grading and drainage work being carried out by a number of roads? What influence causes

one rail in double-track territory to run against the direction of traffic? How should failed rails be classified? Abstracts of these discussions will appear in a subsequent issue.

In brief opening remarks, President Banion reviewed the circumstances which led to the cancellation of the usual annual meeting; spoke of the many difficult problems which still confront track maintenance officers; and urged the continued support of the association.

In the absence of a regular meeting, the present officers of the association will continue in office until the next annual meeting is held. However, to fill a vacancy created by the resignation of J. M. Miller, superintendent, Western Maryland, Cumberland, Md., E. J. Brown, en-

gineer of track, Chicago, Burlington & Quincy, Chicago, and a director of the association, was advanced to second vice-president, and Cornell Halverson, division roadmaster, Great Northern, Willmar, Minn., was elected a director to replace Mr. Brown. In addition, A. G. Reese, district engineer maintenance of way, Chicago, Burlington & Quincy, Galesburg, Ill., was elected a director to replace F. E. Schaumburg, former roadmaster, Chicago & North Western, and now special representative of the Caterpillar Tractor Company, Peoria, Ill.

During the closing hour of the meeting, the Executive committee selected the following subjects for study by committees during the ensuing year: Stabilization of the

Roadbed; Field Repairs to Work Equipment, Including Track Motor Cars; Prevention of Damage to Rails; Modern Methods of Right-of-Way Grading and Drainage; Selection and Maintenance of Ballast; and Yard Maintenance Under Extraordinary Traffic.

There was no exhibit of track materials and equipment by the Track Supply Association, a feature which for many years has formed an important supplement to the regular meetings of the association. Elsewhere in this issue, however, is presented a message from the President and Secretary of the Track Supply Association, expressing their hope that the time will soon come when both associations, jointly, can resume their normal activities.

## Operation and Maintenance of Work Equipment

### Report of Committee

IN keeping with the broad scope of its assignment, your committee has studied the operation and maintenance of practically every important type of work equipment being employed by the maintenance of way forces today. However, because of the limitations placed upon the length of its report, it has found it possible to discuss only a relatively few types of this equipment, and in some cases, it realizes, quite inadequately. This is unfortunate because of the vital part that work equipment is playing in the operation of our railroads, and the importance of utilizing and maintaining this equipment more effectively and efficiently than ever before.

#### Ditching Machines and Tampers

Although the on-track steam ditcher has been superseded gradually by off-track crawler cranes and shovels, it still serves as a useful machine in roadway maintenance, and such ditching machines are still utilized on many railroads for building roadbeds and clearing slides. They are especially valuable for ditching out cuts where off-track machines do not have sufficient room in which to operate. In some cases these ditchers have been converted into rail loading machines and general-purpose cranes.

General repairs to steam ditching machines on most railroads are usually handled by the mechanical department, although an increasing number of roads are consolidating this class of work with other roadway machinery repairs. Regularly as-

signed operators are usually employed on these machines. These men should be held responsible for their routine maintenance and should exercise every precaution not to tax them beyond their capacity.

Air compressors play a vital role in maintenance of way department work. They are used to operate pneumatic tie tampers, riveting tools, paint spray guns, paving breakers, drills, grinders, rock hammers, concrete vibrators, cement guns, saws, and various other tools and machines.

In selecting an air compressor, the number of tools to be operated by it, and the air consumption of each tool, must receive primary consideration.



W. H. Moore  
Chairman

All compressors having a capacity of 60 cu. ft. per min. or more should have a regularly assigned operator if they are to be in continuous service. The operator should be thoroughly versed in the routine maintenance required by the machine and should be capable of recognizing apparent defects in operation. He should not, however, be allowed to undertake major repairs.

An extra set of compressor valves should be kept with the compressor. This will enable the operator to change out the old valves and to send them to the division mechanic for repairs. Other wearing parts, such as fan belts, magnetos, carburetors, spark plugs, radiator core sections and gaskets, should be readily available at a central supply shop to enable the operator to prevent major delays to the machine. It is advisable to bring all air compressors into a central shop at least once a year for a thorough check-up and general repairs.

Perhaps the most important function of an air compressor, and one with which we are all concerned, is the operation of pneumatic tie tampers. Compressors of 60 cu. ft. per min. capacity are generally used to operate four pneumatic tampers; compressors of 105 cu. ft. capacity are used to operate eight pneumatic tampers; and compressors of correspondingly larger capacities are used with a larger number of tools. Compressors of 60 cu. ft. capacity are generally mounted on pneumatic tires, while compressors of larger size, used with surfacing gangs, are mounted on

either crawler treads or flanged wheels. Crawler-type compressors are extremely advantageous in that they are capable of propelling themselves and of staying clear of the track.

Pneumatic tie tampers wear with use, and as this wear progresses they consume more air than the compressor will deliver. The division mechanic should be equipped with a toolometer to check the air consumption of pneumatic tampers, and when they are drawing more air than the compressor will deliver, renewals should be made. The old tampers can be returned to the factory for reconditioning. The division mechanic should also be equipped with orifice gages to check the output of compressors, and should be familiar with the procedure involved in conducting such checks.

Periodic inspections by the division mechanic are essential to insure the efficient operation and satisfactory maintenance of any air compressor.

In many cases it will be advisable to carry a spare pneumatic tamper with each spot-tamping or surfacing outfit. This will permit the repair of a single unit without interfering with the work being done.

#### Electric Tie Tampers

The portability and simplicity of electric tie tampers make them highly desirable for section gangs, spot-tamping gangs and surfacing gangs. A section force consisting of a foreman and five men can operate a four-tool electric tamping outfit very efficiently. Surfacing gangs employing four-tool or eight-tool outfits can perform work that will compare favorably with mechanical tamping by other methods.

The power unit, consisting essentially of a gasoline engine and generator, is the most vital part of the electric tamper outfit, and the quality of the work performed depends to a large extent upon the condition of this unit. Due to the high speed at which the engine of this unit operates, it is recommended that it be overhauled periodically. The generator brushes, commutator and slip rings should be checked periodically and the required repairs made. In many cases, burned commutators can be repaired by cutting off the burned and fused surfaces in a lathe. A tachometer is desirable for checking the engine and generator speed.

The tamper motors should be dismantled every ten days and the bearings inspected. Rough bearings should be renewed, and all bearings should be packed with an approved lubricant and in accordance with the manufacturer's specifications. Care must be exercised in removing defective bear-

ings or the rotor shaft will be damaged. The belts on the tamping tool on which the motor and blade are suspended must be properly adjusted at all times. If improperly adjusted, the motor will be overloaded and excessive vibration will be placed on the operator. The tamping tool should not be used for forcing tie plates into place nor should it be allowed to strike the rail excessively, as damage will be done to the tamper motor.

The foreman in charge should be thoroughly versed in the care and operation of these machines and must be capable of recognizing apparent trouble. With proper field maintenance and overhauls at specified intervals, the time lost through mechanical failures of these units can be held to a minimum.

In addition to their use for tamping ties, the power units of electric tie tamping outfits can be used effectively for floodlighting night operations and work in tunnels, and also for operating many small electric tools used in both track and bridge work.

#### Unit Tie Tampers

The gasoline-operated, self-contained tie tamper provides a much needed tool for spot surfacing. Being portable and easily handled by one man, tools of this type can be moved about readily in busy territory. Furthermore, they are year-around units. During the winter, chisel-edge tools may be substituted for the tamping bars and the tampers used in the excavation of frozen earth, the removal of ice in tracks, ditches and tunnels, and the breaking up of crossing paving. They will handle these and other jobs with minimum time and labor.

#### Joint and Flange Oilers

Joint and flange oilers are used for applying metal preservatives to the rail to protect it against brine damage, as well as for oiling angle bars. Where used, the preservative is generally applied to both sides of the rail as it has been found cheaper to do this by machine than to oil the joints alone by hand.

Most of the machines for applying oil have been built by the roads using them. They consist essentially of a cylindrical tank, a power-driven pump and a series of spray nozzles. The tank is mounted on flanged wheel trucks, and the pump is employed to pump the oil from tank cars to the machine, as well as from the tank on the machine to the nozzles. The spray nozzles, which are adjustable, are mounted on the front of the machine in such manner that they can be controlled by the operator. The machine

is propelled by a heavy-duty motor car. Since machines of this type are not used often, they should be properly stored when not in service.

It is advisable to strain the oil before it is placed in the tank to prevent clogging of the spray nozzles. When in operation, spare nozzles and swing joints should be kept with the machine as these parts are frequently damaged if the operator fails to lift them clear of any obstruction. Otherwise, the maintenance on such machines is low and the dividends they pay in rail protection are high.

#### Grading Equipment

Grading equipment is now being used to an increasing extent for ditching out cuts, line revisions, grading for new tracks and numerous other earth-moving requirements. The wide variety of work which this type of equipment will perform makes it particularly valuable, but the maintenance required on such units is heavy and extremely important.

Regularly assigned operators are generally employed on these machines. When first placed in service, a representative of the manufacturer should be on hand to familiarize the operator with what the machine will do and with the routine maintenance required to keep it in first-class condition. Detailed lubrication charts should be furnished the operator and the importance of utilizing the proper grades of lubricants with each machine should be stressed.

For equipment powered by Diesel engines, a spare set of injectors should be kept on hand and should be installed when the engines become sluggish. Poor injection is harmful to a Diesel engine.

There are many wearing parts on grading equipment. Such parts should be watched closely as they can often be reconditioned if the wear is not allowed to become excessive. It has been found that the hard-surfacing of track rollers, sprockets, cutting blades and grouser shoes will prolong their life considerably.

The rugged construction and strength of such equipment often leads to using it under conditions for which it was not designed. This is brought about more often upon the orders or suggestions of supervisory officers than by machine operators themselves. Decision as to the ability of the machine to do a certain piece of work should be left, to a large extent, to the judgment of the operator as he is generally more familiar with its capacity than others.

All such equipment should be brought into a central shop for check up and repairs at least once a year, as



there are always many repair jobs that can be done in the interest of preventing major breakdowns.

### Automobile Trucks

The use of automobile trucks for transporting men and materials has proved highly beneficial at many points where these trucks have been employed. Trucks of 1 to 2-ton capacity, with 12-ft. platforms and side stakes, are recommended for use by extra gangs and around large terminals where motor cars cannot be operated satisfactorily.

Trucks of the  $\frac{1}{2}$ -ton and  $\frac{3}{4}$ -ton pick-up class are used advantageously by field mechanics in carrying out their work of repairing and overhauling roadway machines. Such trucks can be equipped with bodies suitable for carrying the spare parts and tools that are essential in making field repairs.

The assignment of such trucks should be governed by the nature of the work required. Definite commitments should be made in assigning all trucks, and no exceptions should be made, except in emergencies. Regularly assigned operators are recommended for trucks not used by any one individual. These operators should keep their trucks in first class condition at all times, and should be held responsible for so doing.

Lubrication and oil changes should be carried out at the intervals prescribed by the manufacturer. Ordinarily, lubrication work can be done more effectively by an authorized service station, where facilities for high-pressure lubrication are available, than by the operator himself. Lubrication charts are furnished with all trucks and are essential for thorough lubrication. Tire inspection should be made at prescribed intervals and the tires should be shifted as they wear.

The greatest detriment to the life of a truck, outside of improper lubrication, is the tendency to overload it. Therefore, it is essential that the operator be familiar with the capacity of his truck. If he is in doubt, he should err on the safe side. Overloading leads to wheel bearing and axle failures, shortened tire life, and excessive engine wear. A well-maintained and properly used truck will give many years of service.

### Ballast Conditioning Equipment

Ballast scarifiers are advantageous for cutting ballast cups away from the ends of the ties and for re-dressing the ballast to standard section. Two trips with the scarifier points and two trips with the dressing blades are usually required for this work.

The machine is usually operated at about five miles an hour when scarifying and about eight miles an hour when dressing the ballast. It has been proved that ballast scarifiers and ballast discers will not only improve the riding condition of the track, but will also increase the useful life of the ballast and prolong the periods between surfacing. The main disadvantage of such machines lies in the fact that they are mounted on flanged wheels and cannot be removed from the track readily.

Operators are generally assigned to ballast reconditioning units, and if they are thoroughly versed in their operation, they can usually handle all routine maintenance and repairs required.

One type of ballast cleaner available does not interfere with train operation and has proved very satisfactory. This type of machine should not be used when the ballast is too wet to permit screening it readily, and it should not be operated in frozen ballast. If the ballast is cemented for any reason, it is advisable to break it up with picks or by some other satisfactory method, ahead of the machine, to prevent placing too severe strains on the machine. The operator and others working with the machine must watch carefully for objects in the ballast, such as large rocks, signal cables, drains, etc., which might foul and damage the machine.

### Rail Laying Cranes

More and more roads are finding the light, full-revolving type crane an ideal machine for rail laying, and for the handling of track material along the right of way and in material yards. This type crane is mounted on four flanged wheels, is self-propelling, and can be easily untracked and re-tracked. Frequently these machines are equipped with clamshells of  $\frac{1}{2}$ -yd. capacity, which they handle satisfactorily.

As an extra item of equipment, these cranes can be equipped with a generator and magnet for the handling of track fastenings. The use of the magnet saves a large amount of time and labor.

### Crawler-Type Hoisting Units

Under this heading are discussed crawler-type gasoline and Diesel-powered clamshells, draglines, shovels and front-end loaders. In the original purchase of any of these types of machines, great care should be exercised to buy the type machine best suited for the work it will be required to perform. If the machine is to be used in wet ditching or road building, par-

ticular attention should be paid to the width of the treads to avoid its bogging down.

For ditching and road building, some railroads are using gasoline and Diesel shovels mounted on flat cars. The best feature of this method is that it can be used in some cuts where it would be impossible to operate the shovels off track.

Most shovels of this type can be equipped to handle a clamshell bucket or a drag bucket. In every case, however, the manufacturer's specifications should be followed carefully in selecting the weight and capacity of the bucket to be used. Bucket teeth should be built up by welding periodically, and should not be allowed to become dull, since this increases the strain on the machine.

Careful attention should be paid to keeping the fuel used in these machines free of harmful foreign matter. Oil and oil filters should be changed regularly. Where several machines of the same make and type are in use the provision of a relief motor to replace a failed motor may prove desirable. The investment in these machines is higher than for any other type of work equipment, with the result that out-of-service costs are proportionately higher. Every effort should be made, therefore, to prevent breakdowns by proper lubrication, cleanliness, proper handling, and periodic inspection. Repair parts should be ordered for these machines prior to their being shipped to cut down the length of the out-of-service period.

Front-end loaders require considerable attention because of their many working parts and the hydraulic system forming a part of their operating equipment. The tendency is to overload and strain these machines by operators unfamiliar with them. This should be avoided.

The success or failure in the use of clamshells, draglines, front-end loaders and shovels depends largely upon their operators. If they know their machines and are proud of them, they can keep repairs to a minimum.

### Bolt Tightening Machines

The speed and accuracy of a power-driven bolt-tightening machine for the periodic tightening of bolts out-of-face, or when laying new rail or changing angle bars, cannot be equalled by any other method. Most of these machines are equipped with automatic cut-outs for disengaging the engine clutch when the desired bolt tension has been obtained. It is important that such cut-outs be kept in proper working order to assure that sufficient tension is being applied,



while at the same time prevent failures as the result of applying excessive tension.

Several important features must be considered for the most efficient operation of a bolt tightening machine. The chucks must be revolving when applied to the nuts. For initial loosening or final tightening, the low-speed gear reduction must be used. Using the high-speed gear reduction for such operations will overload the machine. The high-speed gear reduction is used only for running on nuts to the point of final tightening, and for running off nuts that have been loosened. Several spare chucks should be kept on hand to fit the various size nuts encountered. When chucks become worn excessively, they can be turned over to the welding force for reconditioning.

### Rail Drills

Power-driven rail drills are used in rail laying operations, in putting in rail behind rail detector cars, when cropping rail, and in general track maintenance. The use of these drills speeds up the work considerably and requires much less effort on the part of the operator than hand-operated drills. Such drills are made up of many speed-reducing gears and include a number of roller and ball bearings. It is essential that the proper lubricant be used regularly in maintaining them.

There is always a tendency on the part of the operator to speed up the operation of rail drills to produce faster drilling. This not only ruins the drill bit, but is detrimental to the life of the machine. The engine should not be operated at a speed higher than that recommended.

### Spike Pullers and Adzing Machines

The use of spike pulling machines is confined largely to rail laying operations. Two machines can stay well in advance of a rail laying gang and can remove all the spikes except those directly alongside the angle bars.

The spike tong jaws of these machines must be kept sharp at all times for efficient operation, but they should not be sharpened to a knife edge. In reconditioning the jaws by grinding, care must be exercised to avoid overheating them as this will draw the temper. The belt guide pulleys on these machines should be released when the engine is cranked. This will not only expedite starting, but will also prevent damage to the machine if the engine should backfire.

When laying new rail, or when replacing tie plates, an adzing machine is indispensable. The quality of the work done by such a machine is far

superior to that by hand methods.

The operators of adzers should be equipped with shin guards and goggles to protect them from flying particles. The ties should be swept clean of ballast and cribbed between to a level well below the adzing surface. All ties should be inspected carefully for deadhead spikes, and such spikes should be driven well below the sur-

Off-track Crawler Machines Are Used for Many Maintenance and Grading Jobs



face to be adzed. The cutter guard should be well maintained at all times. One man should be assigned to the bit grinder. Caution should be exercised not to overheat the bits when grinding, to prevent drawing the temper. Frequent checks should be made by a tape line or rule to make certain that the machine is set to cut the ties properly.

The oil bath air filters with which these machines are equipped should be removed, thoroughly cleaned, and filled with new oil at the end of each day's work. The machine should also be thoroughly lubricated and cleaned each day. The cleaning is especially important on machines equipped with air-cooled engines.

There is a tendency in the use of such machines to keep the endless drive belt too tight. This should be avoided as it not only ruins the belt but damages the cutter spindle bearings as well. The endless belts used should be those approved by the manufacturer, since these are designed to do the work required of them.

Care should be exercised in removing the adzing machine to and from the track. It is somewhat heavier than the ordinary track machine and rough handling will damage vital parts.

### Power Track Jacks

The power track jack usually consists essentially of a 4-cylinder gasoline engine driving two heavy screw jacks by means of worm gears. The entire outfit is mounted on a flanged-wheel carriage, designed so that it

can be clamped to the rail. The lifting power of such machines is approximately 30,000 lb. In the use of these machines, caution must be exercised to keep the worm gears and screws clean and properly lubricated, as an accumulation of foreign matter will damage them.

More recent models of power track jacks lift by means of two hydraulic

rams. These are operated by oil at high pressure, supplied by two plunger pumps, which are driven by a 6-hp., air-cooled engine. The latter type jack is lighter and easier to handle:

### Mowing Machines

Track mowing machines are used quite extensively on lines where weed control is a major problem. There are many moving parts on these machines and they require considerable maintenance. A supply of extra blades and guards should be carried with these machines while in operation because of the high rate of breakage caused by striking hidden objects along the roadbed. No repairs or adjustments to cutter bars should be attempted while the machines are in motion. The sickles must be kept sharp and changed as often as required to cut properly. Where extension cutter bars are used, the speed of the engine should be reduced to a point where no vibration or whip occurs.

The off-track, tractor-type mowing machine is rapidly coming into the picture for railroad weed control. This type machine has the important advantage of leaving the track clear for traffic. It is designed to work under severe conditions and will perform satisfactorily in any place that a tractor can be operated.

Committee—W. H. Moore (chairman), supvr. wk. equip., Sou., Charlotte, N. C.; A. H. Whisler (vice-chairman), asst. engr., P. R. R., Philadelphia, Pa.; F. H. McKenney, dist. engr., m. of w., C. B. & Q., Omaha, Neb.; A. E. Botts, asst. engr. m. of w., C.

& O., Richmond, Va.; W. E. Chapman, div. engr., C. of Ga., Columbus, Ga.; C. F. Edwards, div. engr., C. & O., Columbus, Ohio; E. E. Edwards, sec. fore., S. P., Medford, Ore.; W. L. Fowler, rdm., D. M. & I. R., Two Harbors, Minn.; E. M. Gambill, rdm., A. T. & S. F., Marceline, Mo.; Cornell Halverson, div. rdm., G. N., Grand Forks, N. D.; E. B. Harris, gen. supvr. rdwy. equip., S. A. L., Hamlet, N. C.; A. L. Kleine, div. engr., D. R. G. & W., Grand Junction, Colo.; F. H. Masters, ch. engr., E. J. & E., Joliet, Ill.; B. F. Myers, rdm., G. C. & S. F., Dallas, Tex.; Leonard E. Smith, rdm., M. P., Pueblo, Colo.; H. L. Standridge, rdm., C. R. I. & P., Fairbury,

Neb.; M. C. Taylor, supvr. of wk. equip., L. & N., Louisville, Ky.; and I. D. Talmadge, dist. engr., N. Y. O. & W., Middletown, N. Y.

### Discussion

President Banion suggested that the ordinary four-tool compressor, especially after it has seen considerable service, does not supply enough air for four tamping tools, and asked if others had had similar experience with these units.

F. G. Campbell (E. J. & E.), replying to Mr. Banion, said that the new type tamping units have less air consumption than the older types and that a 60-cu. ft. compressor will operate four of these tools satisfactorily. He agreed, however, that a 60-cu. ft. compressor will not operate four of the older type tamping units very satisfactorily, since they consume more than 15 cu. ft. of air per minute, even when in good condition, and much more than 15 cu. ft. if not in good condition.

## Prevention of Accidents to Trackmen

### Report of Committee

THE subject of safety and accident prevention has always been one of great importance before meetings of the Roadmasters' association, and, in view of the serious shortage of manpower in the country today, and the effect on the war effort of each man-hour worked or lost, it is now a subject of greater importance than ever before.

Your committee has gathered a large number of valuable suggestions, largely along the same line, relative to accidents and their prevention. All maintenance officers are agreed that we can no longer select our employees, but must work practically any and all types of men. Nearly all of the new men available today are either too old or too young, on the basis of previous standards, or are physically unfit for military duty. Therefore, to begin with, we do not have normal new material to work with, and thus even greater precaution must be used to prevent accidents than was necessary in normal times. Furthermore, nothing is normal on the railroads these days, which adds to accident hazards.

### Safety Rules

Much stress has been laid by members of your committee on the use of safety rules. In a few instances, railroads without a specific set of safety rules have good safety records, but they are the exceptions, rather than the rule. On several roads without specific safety rules, plans are under way to devise such rules and to insure their enforcement.

A comparison of the safety rule books in effect on various roads brings out the fact that the problems and experience of these roads are identical—that the safety rules of any one of them is equally applicable to any of the others. At least along safety

lines, therefore, we all have similar aims—the same goal.

We should bear in mind that each and every safety rule of today was created as the direct result of an accident that could have been prevented if such a rule had been in force at the time of the accident. To create such rules, every accident must be investigated promptly and outlawed, and methods must be devised whereby similar work can be accomplished safely without a repetition of accidents. A deep and lasting impression is made upon the men under our direction when they are brought to realize that the book of rules is, in reality, a book on accidents that could have been prevented.

Simply creating rules is not enough. They must be consolidated into a rule book, or code of safety, and made available to all employees. After coming into possession of such a rule book, the employee must have the



J. T. Shepherd  
Chairman

various rules explained to him, and the reasons given for including each rule in the book.

Some foremen read the entire rule book, or a large part of it, to their men once each week, accompanied by a general discussion, which is of benefit to all present. Usually at the dinner hour, sufficient time is available for this purpose.

To encourage the observance of safety rules and to discourage unsafe practices, a group of employees from all branches of service, composing a division "Safety committee," can probably do more than any other means. These members are usually appointed by the division superintendent for a term of 12 months, and usually get together in regular meetings once a month.

The members of such committees must make it plain that they are not spying, instead, they should make it clear that they are out to see that the safety rules are obeyed and to receive reports of any unsafe conditions existing, with view to taking up such conditions at their meetings and of devising ways and means of correcting them. At these meetings, all accidents reported during the preceding month are discussed, and plans made to prevent their repetition. A significant effect of these committees is that, after serving a year as a committeeman, an employee will forever after be safety conscious, and a better employee. These "missionaries of safety" have proved their worth many times.

Your committee feels that supervision and education go hand in hand. An officer should supervise and teach his men at the same time. His instructions should always be given in a manner conducive to safety. He must not only preach safety, but must practice it as well.

For men to see a supervisor break a rule is simply to strike that rule from the book from that time on. Likewise, the supervisor's presence does not warrant unsafe short-cuts at wrecks or emergencies, and no good supervisor will permit such risks to be taken, regardless of the shortage of time. Taking a chance is a poor way to save time. Supervisors must obey the rules at all times and always set the proper example.

The education of a new employee is the duty of every older employee in the service. He must be shown what to do, what tools to use, and how to use them. A great deal of patience must be expended in this effort. If after repeated instruction, a man fails to work safely, he should be reprimanded, gently at first, and stronger as time goes on. Continued failure to work safely warrants a dismissal, which is much better than a serious injury. However, the object of our safety methods is to save manpower, and we must use every method to improve the ability of our workers, and to keep them, rather than dismiss them. Dismissal must be the last resort.

Some railroads employ a "Safety Car" in their safety instruction work, which moves from place to place over the system, stopping usually a day and a night at outlying points, and several days at terminals. The Safety Car is equipped for showing sound pictures and for demonstrations and lectures. The meetings held on these cars are usually opened with a talk by the safety agent on the importance of safety, and a discussion of recent accidents. Slides are shown picturing accidents in the making and how they could be prevented, along with gruesome pictures showing the result of unsafe practices. After this, a safety movie is shown. This always has an interesting theme and entertaining events, but at the same time always contains important morals with respect to safe working and living conditions. Another short talk, and the men are released to ponder over what they have seen and heard. Attendance is compulsory, and to the uneducated laborer, the program is presented in a way that he can understand and appreciate. For weeks one can hear comments among the men about things shown in the Safety Car. Nothing else seems to reach as many employees as effectively as such a car.

Employees' families and friends are invited to attend the meetings on the car, primarily so they will encourage the "breadwinners" to work safely, and thereby avoid loss of time and the grief resulting from accidents.

To prevent an accident from recurring, it must first be understood thor-

oughly, and to understand an accident thoroughly requires an efficient investigation. To be efficient, the investigation must be made promptly at the scene of the accident, and by responsible supervisors with as many witnesses present as practicable.

### Investigation of Accidents

It usually falls to the roadmaster to investigate the accidents that occur among the maintenance of way forces on his district. Frequently he is accompanied by the safety agent and the investigation is made jointly. To make the investigation promptly permits securing a clearer picture of just what took place and why. Usually a lapse of time tends to dull the memory of witnesses, who after a time attach less and less importance to the event, and thereby impair their own safety and efficiency. A prompt investigation reminds employees that the management is much concerned over their safety and is quick to act in their interest. This helps to reduce carelessness, as these investigations are not pleasant for anyone.

It is a blow to the prestige of any gang or group to be investigated. They suddenly realize that they have failed in some way and that the officers of the road are out to determine how and why they failed, and to determine whether discipline is in order because of the failure. They know they are being watched and that they must be more careful in the future.

To secure signed statements from each of the witnesses and the foreman in charge is the best way to secure all of the information as to the cause of an accident; also to bring out the whole truth concerning it. Likewise, to investigate an accident on the ground gives the supervisor and the safety agent a chance to observe the force involved while at work. If the foreman is not safety conscious, it will usually show up then and there in the way his men work and handle their tools. Such an investigation also affords an opportunity for an impromptu safety talk, which is always in order.

After all the facts concerning an accident are gathered, together with the statements of witnesses, a report in writing is made to the superintendent, showing the cause of the accident and recommendations for discipline. These reports also usually include recommendations for avoiding similar accidents in the future. Any gang that is investigated frequently finds itself in an embarrassing position and will work harder to improve its safety record—to "get out of the cellar" as it were.

No work should be started without a definite plan, and the foreman or supervisor in charge must feel certain that the plan is understood by all involved. Also, he must satisfy himself that the tools and equipment to be used are in safe and workable condition. A good lineup of trains should be obtained before starting any work, and frequent consultation with the dispatcher should be maintained. Regardless of the location of trains, proper flag protection should be maintained whenever work is in progress that makes the track unsafe, or when the workmen cannot see or hear clearly. When doing such work as welding rail ends, grinding, and tamping with power tools, it is impossible for workmen to protect themselves adequately. Therefore, for these classes of work flag protection should be provided.

Extra forces on strange districts cannot exercise too much caution for the protection of train movements and themselves. Each and every laborer must watch out for himself and his neighbor as well. The older workmen especially must counsel and guide the newer and younger men and show them the safe manner of doing work. Many a new man must be forced to wear goggles when cutting rail, and otherwise cautioned concerning his and his fellow workmen's safety. The older employees can usually impress these new men with gruesome tales of accidents in past years when safety devices were unknown.

During the last few years our railroads have become machine conscious. The present manpower shortage has been alleviated in part by the increased use of machinery, such as adzers, spike pullers, cranes, power wrenches and the like. The use of such machines has changed much of our labor from unskilled to skilled or semi-skilled labor. Men assigned to run machines must be picked and qualified by the supervisor, and he must be most careful in his selection. The care and proper use of a machine must be impressed on each new operator, and the foreman or supervisor in charge must know personally, before starting the day's work, that each machine is in safe working order. If any machine is not in safe working condition, it must be held out of service until put in a safe condition. The worn cable that "might last a few days longer" must be renewed; wheels with worn flanges must be replaced before they fail. Many accidents attributed to track machinery would not have happened if the operator or foreman in charge of such machinery had ascertained its true condition before beginning work. Certainly no time will be gained by



omitting this daily inspection, which at best takes but a few minutes.

All of this sums up to the necessity for good planning, for careful inspection of tools and machinery, and for ample protection from traffic, if we are to execute our work safely.

### Handling Material

No one feature of track maintenance is responsible for more injuries than the handling of materials. The proper way to lift heavy weights is learned through instructions, rather



Many Accidents Can Be Avoided by Proper Care in Handling Materials

than instinct. Many ruptures have occurred because the lifter had his feet apart and used his back muscles, instead of keeping his feet close together and using his strong thigh muscles. If no crane is available, very heavy weights should be lifted only by sufficient manpower to handle them safely. In any case, when lifting must be done by men alone, the greatest care and supervision must be exercised to prevent injury.

The lifting of rails, frogs and other heavy objects should be done with power equipment, and care must be exercised to see that the pieces to be lifted are free from other pieces before they are raised. Where a crane is used, the boom must be centered properly to prevent swinging. Such material as rail should be loaded on cars in tiers, with strips of wood between them, to facilitate safe and efficient handling. The additional time and expense of such loading is more than compensated for by the speed and safety possible in unloading. Low-side gondolas should be used when possible because of the greater vision they afford.

When unloading material out of any type of car, great care must be taken that no one is alongside the car in line with the unloading. Further-

more, no material should be unloaded when trains are passing on adjacent tracks. After unloading material, it is wise to note whether any of it is leaning against or is on top of the rails, as such could cause serious trouble if struck by a train.

When rail must be handled by hand, sufficient men should be used to prevent undue strain on any of them and to insure full control over the movement of the rail. At the same time, the men must be spaced properly to equalize the load and to permit their free movement. Men

should not be allowed to ride on push cars loaded with material, and when handling material on push cars a slow speed should be maintained.

### Operation of Motor Cars

The usual method of transporting men and tools to and from work is by motor cars. At best a motor car on a main line track involves many hazards, but these can be overcome by proper training and obedience to the rules.

Only a qualified operator familiar with the rules should be permitted to operate a motor car. Usually this man is the foreman himself, although in many cases the foreman trains a trusted employee and qualifies him in motor car operation.

In all cases before proceeding on a motor car trip, a lineup should be obtained from the operator or dispatcher. This, it should be understood, is for information only, and does not relieve the motor car operator of responsibility for the protection of his car. The information contained in the lineup should be read to all of the occupants of the motor car and everyone should be made familiar with the location of trains at that time. This is important because an

entire gang is not likely to overlook a train.

Before starting out, a few minutes for inspection of the motor car is worthwhile, to see that the brakes are working; that wheels, running gear, etc., are in a safe condition; that the men are properly seated; and most of all, that tools are loaded in such manner that they will not fall off and wreck the car. Jacks and other heavy tools should be placed near the forward end of car, inside the rack or railing provided to hold them in place safely. The car should never be overloaded.

Following the inspection, the car must be cranked, and experience has taught that the best method to do this is to prime the motor by turning it over a few times with the ignition off. Then, with the ignition on and the spark retarded, one or two quarter turns *upward* will usually start the motor. Care should be taken to keep one's body away from the crank, and the fingers and thumb on same side of the handle. If all this should fail, it is safer to push the car to start the engine than to spin the crank.

Everyone should be seated when the motor car moves off. Some of the men should face forward and some to the rear. All should be on the lookout for trains, motor cars or obstructions, and all unnecessary talking should be prohibited. A safe speed should be maintained at all times and a very slow speed should be used when passing trains or cars on adjacent tracks, and when moving over grade crossings. A bell or horn should be sounded frequently under such conditions to prevent striking persons who may come suddenly on the track.

A motor car should be brought to a full stop before anyone is allowed to get off. If it is to be turned or set off the track, a full understanding should be had by all of the move to be made; the motor should be *off* and the car unoccupied at the time; and the men should be properly placed before lifting and turning is started. All heavy tools and materials must be taken off before lifting a car.

### Conclusion

In conclusion, your committee is convinced that accidents to trackmen can be greatly reduced by the following means:

- (1)—A workable set of safety rules, properly taught and enforced.
- (2)—Increased and improved supervision and education, using lectures and moving pictures.
- (3)—Prompt and thorough investigation of all accidents.



- (4)—A definite plan in execution of work, using only qualified machine operators and foremen.
- (5)—Increased use of power machines in handling material.
- (6)—A set procedure to be followed in the operation of motor cars, not to be varied from.

In view of our war effort and the man-power shortage, every effort must be made at all times to reduce accidents and to keep our men on the job.

J. T. Shepherd, Jr. (chairman), rdm., N. & W., Buena Vista, Va.; J. C. Jacobs (vice-chairman), div. engr., I.C., Water Valley, Miss.; W. H. Sparks, gen. insp. trk., C. & O., Russell, Ky.; G. B. Aydelott, rdm., D. & S.L., Sulphur Springs, Colo.; M. R. Black, asst. div. engr., L. & N., Evansville, Ind.; W. A. Davidson, rdm., U. P., Grand Island, Nebr.; J. F. Foley, rdm., C. B. & Q., St. Joseph, Mo.; J. H. Gibbs, rdm., M. P., Coffeyville, Kans.; J. G. Gilley, div. engr., C. & O., Richmond, Va.; Walter Lakoski, div. engr., C. M. St. P. & P., Mason City, Ia.; Geo. W. Lentell, supvr., N. Y., N. H. & H., Taunton, Mass.; G. B. McClellen, gen. rdm., T. & P., Alexandria, La.; G. P. Palmer, engr. maint. & con., B. & O. C. T., Chicago; T. L. Robinson, gen. supvr., A. & E. C., New Bern, N. C.; R. B.

Rust, Jr., supvr., Sou., Chattanooga, Tenn.; V. P. Shepardson, rdm., T. C. I. & R., Ensley, Ala.; G. E. Stewart, asst. div. engr., S. P., Portland, Ore.; Harold D. VanVranken, asst. div. engr., S. A. L., Jacksonville, Fla.; and Fred E. Wall, asst. div. engr., Alton, Bloomington, Ill.

### Discussion

R. E. Cramer (research engineer, University of Illinois) commented that the report did not say anything about first aid, and suggested that teaching the men the regular Red Cross course on first aid would be very beneficial, since accidents are discussed all through the course in a manner which tends to develop safety consciousness.

President Banion said he believed that most railroads teach some of the first aid principles similar to those taught in the Red Cross courses, and that most large gangs are equipped with first aid kits. He then discussed the problem of handling and loading emergency main track rail by small section forces, suggesting that streamlined rail rests at section headquarters, from which a few men can load the heavy rails easily onto push cars, were

better than rail rests scattered out along the line. The rail rests at the section headquarters, he added, also provide the advantage of being located at points where motor car line-ups can be secured.

W. H. Sparks (C. & O.) said that the problem of handling heavy rail, such as 131-lb. rail, for emergency renewals with a small force was a real one, and recommended that two or three sections should be doubled-up to provide enough men. The same thing must be done to renew turnout frogs in the main line, he added.

Mr. Sparks also stated that his road publishes a safety digest every month in which the accident averages of the various departments are listed, and showing, therefore, which departments have had an increase or decrease. This is helpful, he said, in reminding the various departments just where they stand, and serves as an incentive to officers to keep their records as good as possible. Mr. Sparks went on to recommend that everyone read a poem at the end of an article entitled, Example Is the Best Safety Teacher, published in the August issue of *Railway Engineering and Maintenance*.

## What the Trackman Can Do To Speed Up Train Operation

### Report of Committee

FROM only a thin fringe along the Atlantic seaboard and but a few military forts along the broad shores of the St. Lawrence river, the progress of civilization on the North American continent has followed in the wake of railroad development. Just as the crude steam wagons of the early settlers gave way to the improved modern power and the deluxe equipment of today, so too has the track structure in like manner followed progressive stages of development. These latter accomplishments have been made possible through the efforts of trackmen.

From the nature of their duties, trackmen are brought into intimate and frequent contact with the operation of trains. As most of their activities affect the track structure over which trains must pass, it is apparent that the manner in which they carry out their work can have an important influence on the movement of trains. On the other hand, as the number of trains increases, it is equally apparent that this increased traffic affects the output of the track forces adversely,

as well as the cost of doing their work.

Present heavy war traffic calls for more thorough consideration by trackmen of all of their operations affecting the movement of trains, because it is

possible that many methods of long standing in the conduct of track work should be changed to speed up this work and to prevent interference with traffic. It is to some of these possible changes in methods that reference is made in this report.

### Knowing One's Work

One of the prime requisites of the efficient trackman is that he be master of the basic principles of track construction and maintenance. While this knowledge is a fundamental qualification, it would have little value to the trackman if not combined with judgment, foresight and experience, and a thorough training in the systematic planning and undertaking of work operations, enabling him to give precedence to the more essential items of work, and to defer those of less importance.

Trackmen should be thoroughly familiar with the maintenance of frogs and switches, and should know how to adjust them to keep them safe for the movement of trains at all times.



F. J. Liston  
Chairman

They should have a thorough grounding in the practices of surfacing, lining and gaging, and should be encouraged to keep abreast of new developments by reading the latest publications dealing with track maintenance, and by discussing these developments with their associates. This is important because the man who has attained the greater part of his experience on one job, especially if in one place, will frequently lack the breadth of vision that comes to those who have labored under different conditions. Furthermore, he is likely to become less energetic, or at least less progressive, as his years of service accumulate, if his interest is not kept continually keyed up by an endeavor to improve those maintenance methods already being employed.

### Careful Planning

While trackmen have been confronted with difficult periods during the past, requiring careful planning of their work to insure that the most important details are given first consideration, it has never been more important than now that they put first essentials first if the railways are to continue to handle satisfactorily, and to speed up, their present heavy traffic. Faced with the maintenance of track on which the volume of traffic has increased tremendously and has been greatly accelerated, while at the same time confronted with a shortage of manpower, and the necessity of resorting to the employment of older men and those less physically fit than in former years, not to mention shortages of materials and work equipment, the selection of the work to be undertaken at any specific time may be the deciding factor between efficient and safe train operation and delays and failures.

Today, and just so long as inadequate manpower, inadequate materials and inadequate equipment remain, first needs must come first. Many worthwhile, though non-essential, practices of the past are out for the duration. Convenience must be disregarded, and improved appearance, for appearance sake, must be overlooked. Furthermore, while maximum efficiency in the use of manpower is essential, even that consideration cannot be allowed to interfere with the importance of doing first those tasks that insure maximum safety of train operation.

This latter fact takes on added significance each day as present record-breaking traffic and heavier wheel loads continue to take their toll of the track and structures—a toll which cannot be made good in full because of shortages of manpower, materials

and equipment. Trackmen should make every effort to secure the maximum improvement of their facilities with the materials and labor available.

A comprehensive program is essential to the successful prosecution of any activity, yet, insofar as routine maintenance is concerned, little constructive programming has been done in most cases. It is here then, that from the very nature of the trackman's duties, which are largely of a routine character, that the danger of excessive lost time is greatest. The trackman with his seasonal work carefully scheduled has before him an objective towards which to work. He is not losing time constantly trying to decide what job should be undertaken next. The improvement possible by such preliminary planning, which can be done without the expenditure of a single additional dollar, has been remarkable, and has done much to enable many foremen to bring the track into better physical condition than would be possible otherwise.

One of the most important requirements of a trackman is that he know train schedules on his territory. Most trackmen hesitate, even dread, delaying a first-class passenger train. At the same time, many of them fail to realize the importance of avoiding delays to freight trains. This is because many trackmen, not realizing that the schedules of many freight trains are fast, and their connections close, are unaware or forgetful that these trains must be on time if the output of many industries is to be maintained. The detention of many freight trains could be averted by obtaining a lineup of all trains from the dispatcher or the local agent at the section headquarters.

### Frequent Track Inspection

From the very beginning of railroading, periodic inspection has been one of the most essential activities of the trackman. With the introduction of high-speed passenger and freight service, however, track inspection took on new importance, and the trackman was stimulated to repair defects more promptly than had been the custom previously. With the rapid increase in traffic volume following the outbreak of the war, and the higher average speeds of all trains generally in recent years, track inspection has taken on still greater importance, because defects in line and surface, as well as in rail and fastenings, have been occurring with increasing frequency. Furthermore, where defects occur, they develop much more rapidly to the point where it becomes essential that they be corrected.

It has been observed that under high train speeds, the bolts and rivets

in frogs and switches become loose sooner than formerly, and must be attended to without delay. Defects in line and surface that were scarcely noticeable when speeds of 50 and 60 m.p.h. prevailed, cause increasing discomfort as the speed increases, and at speeds of 90 to 100 m.p.h. may present a real hazard. It is essential, therefore, that track inspection be frequent, regular, detailed and thorough, and that the defects that are found be corrected without delay. Failure to effect prompt remedial measures may lead to the necessity of slow orders or to undesirable failures.

### Slow Orders

Since every delay to a train reduces the capacity of the line to that extent, the causes of all delays should receive careful attention. Not a few delays are due to conditions within the control of trackmen, and one of the most frequent of these causes is the slow order. While slow orders are at times unavoidable, and are essential for the safe movement of trains, they should be employed only when necessary. When they are employed, constant attention should be given to them to insure that they are not forgotten, and every reasonable effort should be made to relieve the condition or conditions giving rise to them at the earliest possible moment.

A simple expedient to that end which has been found valuable by several roads is the practice of requiring train dispatchers to furnish a daily statement each morning showing the number and character of slow orders on their respective territories. Statements such as these serve as a constant reminder of the delays to which trains are subjected, and act as an incentive to trackmen to remove the causes of these delays as early as possible. Investigations of slow orders will also show that a considerable number of them could have been avoided if proper precautions had been taken in advance. While it is difficult, and, in fact, impossible, to anticipate all of the attacks to which a roadbed may be subjected, many of them can be anticipated and prevented by the adoption of adequate precautions. In other words, many so-called emergencies are not, in reality, emergencies, but are the result of failure to adopt reasonable precautions. Most of these can be eliminated by the substitution of a policy of maintenance before, rather than repair after.

### Elimination of Failures

No condition interferes more seriously with the smooth operation of trains than derailments, not a few of

which are due to defective track conditions. The first step in a campaign towards the elimination of derailments is the preparation of an analysis of the location and conditions under which each derailment occurs. With this information, it is frequently possible to detect the cause and to remove it with relatively little difficulty. This is especially important in periods such as the present, when a delay to one train may cause serious delays to many others.

In many instances, as the result of giving close attention to the causes of derailments, it has been found that extraordinary results have been obtained in refreshing the trackman's knowledge of his work—in "wising him up," as it were, to the proper methods of track maintenance; teaching him to avoid the possible delays resulting from improper maintenance.

Major operations such as rail laying or track ballasting should be so organized as to cause as little interference as possible to the operation of trains. Those in charge of such work should keep in constant communication with dispatchers to insure that they have a correct lineup of train movements, and should so arrange their work that trains will not be stopped or delayed. The work should be so organized that there will be little delay in closing for trains. Where a dispatcher's telephone system is in service, it has been found advantageous to have a qualified trainman on the job, provided with a portable telephone, to contact the dispatcher and to keep the gang informed on the lineup of trains. This will relieve the trackmen of this important detail, and will eliminate any misunderstanding as to the time trains may be expected. Where only telegraph service is in use, operators may be used in a similar manner to advantage.

#### Labor Saving Devices

Through the employment of mechanized units of work equipment, trackmen can increase their production to a large extent over hand methods. This can be demonstrated readily by analyzing the operations of almost any one of the power tools or machines now available, even though the efficiency of many of these units has decreased materially because of the smaller organizations made necessary by labor conditions during the present period of hostilities.

It is obvious that a modern rail crane with an operator and three men to heel in new rail, will take the place of 20 to 24 men required to handle 39-ft. rails of 100-lb. section or heavier with tongs, and will also handle far more rail in a day. It is equally

apparent that each modern spike pulling machine, operated by 3 men, will do the work of 14 to 16 men with clawbars; that each tie adzing machine will equal the production of 8 to 10 men with hand adzes; that each power spike driver will drive as many spikes as 4 to 6 men with mauls; and that each power bolting machine will

Work Operations Should be Conducted in Such Manner as to Keep Slow Orders to an Absolute Minimum



do the work of 8 to 10 men with hand wrenches.

Combined in a large, well-organized rail laying gang, it is a known fact that equipment of this nature has at least doubled the production possible by an equal force of men working exclusively with hand tools. Similar increased production per man hour can be shown with practically every item of work equipment.

The employment of tie saws in suitable gang organizations will increase the rate and economy of tie renewals at least 30 per cent over the digging-in method. Power tamping outfits of the unit, pneumatic or electric types are saving from 50 to 60 per cent in man-hours for surfacing, while at the same time producing more uniformly tamped track. With some of the equipment units employed, the advantages obtained are so large as to defy accurate comparison. It would be difficult to estimate the man-hours saved by motor cars on the railways, and in the extensive ditching and drainage programs carried out with the aid of tractors, bulldozers, angle dozers, carryall scrapers, blade graders, ditchers, spreaders, and ice-cutting attachments. While there is no complete substitute for manpower in maintenance, power machines and tools have been able to take the place of a considerable percentage of the manpower needed but not available. The extensive and skillful use of mechanized equipment has done much to enable trackmen to maintain the track structure to the required standard of perfection.

Main tracks should be maintained to the highest degree of perfection, so that maximum permissible speed may be maintained at all times, particular attention being given to surface, alignment and gage. Curves should be checked closely for proper gage and elevation, and defects should be corrected before they magnify and be-

come the cause for complaint or the cause of a failure. Daily inspection of all main tracks is of first importance during this era of high speeds and heavy tonnage.

#### Yard Track Maintenance

The maintenance of yard tracks to a high standard is equally important. The programming of work in yards can be arranged with yardmasters so that tracks or portions of tracks can be turned over to the track forces for certain periods of the day to effect necessary repairs. Switches must be maintained properly and checked frequently for accurate gage. Guard rails should be checked for correct flangeway, and surface conditions should be given adequate attention. It is important to keep yardmasters acquainted with maintenance programs so there will be complete cooperation with the operating department.

#### Drainage

During the summer, attention should be given to drainage in yards to reduce the danger of tracks and switches freezing up during the winter season. Snow and ice are often the cause of serious delays in yards and at interlockings, and to avoid such delays, it is necessary to have readily available, forces organized and equipped to cope with snow and ice conditions on short notice. Where extra forces are employed during the winter, it is advisable to locate them so they can be used at important



points in case of storms, as men who are regularly employed and familiar with conditions are much more efficient than extra men who are picked up as the occasion requires.

Much present-day work equipment, such as locomotive cranes, spreaders, ballast plows, tamping machines, snow blowers, oil, gas and electric switch heaters, and other melting devices, will be found valuable in fighting snow and ice during the cold months.

### Work Trains

The work train has long been a standard unit of equipment for maintenance operations. Their use has been considered standard practice for so long that in many instances they are employed from force of habit, even though increased costs in wages and supplies, and increases in delays to revenue traffic, have caused the total cost of work train service, measured in units of work done, to rise sharply.

From a transportation standpoint, every additional train on a line interferes with others, adds to congestion, and requires the use of locomotives, cars and manpower, which would otherwise be available for revenue service. Because of the serious shortage of power, equipment and crews, every effort should be exerted to keep the number of work trains to a minimum. Where required, the work should be well planned in advance so that the maximum amount can be accomplished. Time lost in clearing for trains handicaps seriously the amount of work that can be accomplished by a work train, frequently requiring an additional number of work train days to complete the work planned.

### Dispatchers Can Help

Train dispatchers can be of inestimable assistance in reducing the lost time of work trains if they are kept advised of the work to be done at each location, and the approximate amount of time required. Care should be taken to see that no work is performed by work trains that can be handled as well or better by some other arrangement. Frequently, this service can be performed by local trains without inconvenience. Again, the hours of work train service can be reduced through the use of labor saving tools, such as the rail unloading bar, rail forks, and rail hooks, all of which speed up the unloading of rail from flat cars and reduce the number of men employed per car.

The use of other modern labor-saving equipment also speeds up many classes of work. Such equipment includes ditching machines, spreaders,

automatic dump cars, self-propelled rail loaders, locomotive cranes and steam derricks. Some of this equipment, being self-propelled, can often replace a work train or motor car. Of importance too, the haul involved in the distribution of various materials can be reduced if care is taken to have all of the material for a job or location distributed at one time.

### Release Equipment Promptly

Cars loaded with company material require the use of much equipment. The number of cars thus tied up can be reduced materially if this matter is given the attention it warrants. Records of cars that have been loaded with company materials should be kept and checked daily to see that cars are placed and unloaded promptly on arrival at destination, and the equipment released for other service. It is equally important that the cars be sent directly to the point or points where the material is required, to avoid re-consignment and extra switching and hauling.

### Motor Trucks

The motor truck can be used effectively in place of work trains, especially in or adjacent to terminals. In a number of such locations, the services of work trains have been dispensed with entirely. On some roads, motor trucks are used for the distribution of all materials, other than rails and other similarly heavy objects, on line, as well as in terminals.

### Personal Injuries

No factor tends to disrupt a well organized work program as much as personal injuries. In addition to causing unnecessary suffering and loss of time to the injured, such injuries bring about considerable delay in the orderly conduct of track maintenance. It is important, therefore, that every workman be acquainted with the precautions that should be practiced to prevent injuries to himself and to his fellow workers.

### Self-Improvement

There is an old saying that a man's success is determined by the way in which he spends his time after six o'clock in the evening, or, in other words, by the manner in which he utilizes his leisure hours. A few minutes' reflection will convince any thinking person that there is much truth in this statement, for it is in the use of this time, which is within a man's own control, rather than that of his employer, that he prepares or fails

to prepare the foundation for his subsequent activities.

Present-day railway service requires men of action, whose movements are directed by a knowledge of modern methods. The successful trackmen today are those who not only possess native ability and resourcefulness, but who supplement these characteristics with the lessons gained from the experience of others. This experience can be secured by personal contact with other men, but it can be secured more readily and to a broader degree by the regular reading of publications whose function it is to collect and present from month to month the new developments and improved practices in track maintenance. Trackmen who read such publications and absorb the information contained therein, have at their command not only their own experience, but also the results of the studies made by others.

The remarkable record of the American railways in helping the war effort, and the tremendous improvements that have been made in everyday track maintenance, have been possible largely because the railways have been blessed with trackmen who have thought not only of the day, but also of the morrow. It is important then, for a still better tomorrow, with still higher train speeds, that trackmen continue to make use of their foresight; that they attempt to achieve the highest degree of perfection in the track which they maintain; that they make the fullest use of the equipment available in all maintenance operations; and that their constant aim be to improve their track and the methods of doing each item of work.

[This report was accepted without discussion.]

Committee—F. J. Liston (chairman), asst. supt., C. P. R., Smith's Falls, Ont.; L. J. Gilmore (vice-chairman), gen. rdm., G. N., Spokane, Wash.; W. O. Frame, supt., Ft. Worth & Denver City, Wichita Falls, Tex.; W. E. Amburgey, supvr., C. & O., Mt. Sterling, Ky.; Leo C. Blanchard, div. rdm., C. M. St. P. & P., Algonia, Ill.; Armstrong Chinn, gen. mgr., Alton, Chicago; E. E. Crowley, rdm., D. & H., Albany, N. Y.; M. H. Dick, eastern ed., *Railway Engineering and Maintenance*, New York; E. A. Eastin, supvr., C. & O., Peru, Ind.; H. C. Fox, trk. supvr., Sou., Spartanburg, S. C.; A. B. Hillman, engr. m. of w., C. & W. I.—Belt Ry. of Chicago, Chicago; J. W. Hughes, gen. rdm., A. C. L. Florence, S. C.; R. L. Longshore, instrumentman, W. P., San Francisco, Cal.; W. C. McCormick, rdm., S. A. L., Savannah, Ga.; J. M. Miller, supt., W. M., Cumberland, Md.; George L. Morrison, div. engr., S. P., Dunsmuir, Calif.; C. L. Nolan, supvr., N. Y. C., Chicago; M. D. Packham, rdm., A. T. & S. F., Emporia, Kan.; W. F. Rambo, div. engr., M. P., Falls City, Neb.; F. E. Schaumburg, rdm., C. & N. W., De Kalb, Ill.



# Effect of Traffic on Service Life of Ties—and Methods of Protection

Report of Committee

THE renewal of crossties forms a very large proportion of annual track maintenance costs, and this proportion will increase because of the increased wear on ties due to the unprecedented volume of wartime traffic, the continued rise in the cost of the labor used to produce ties, and the growing scarcity of timber from which they must be cut. Today's heavy traffic, together with its increased speeds and heavy wheel loads, is greatly increasing the abuse which track and ties normally suffer, and the railroads, as a result, are facing a period of heavier tie renewals in the years ahead. In fact, we are experiencing an accelerated demonstration of the relation between tie life and traffic that may not present itself again for years. A close study, therefore, of the relation between traffic and tie life at this time is of importance.

The effect of traffic on the service life of ties is a factor that is rather difficult to determine. It is not possible to say in terms of tonnage just how long a tie will last, since varying standards of maintenance enter largely into this problem. Certainly, with a uniform standard of maintenance, ties of equal quality in the same locality will show mechanical wear in almost direct proportion to the tonnage passing over them, and even the amount of decay will be closely related to the volume of traffic. Other factors, however, such as the weight of the rail, the size of tie plates, the kind of ballast, the condition of drainage, etc., also have a decided bearing on tie life, and the destructive effect of traffic on ties is definitely affected by the quality of maintenance. For example, one railway reports that in a certain experimental test of ties, those in the main track under fairly heavy traffic have given longer service than some of the same class of ties put in inside tracks at the same time and in the same vicinity. This can be accounted for only by better ballast, better drainage, better rail and a better general standard of track construction and maintenance.

## Mechanical Wear

Prior to 1910, few roads used treated ties and the average life of a tie, under heavy traffic, was only about seven years before it had to be

removed on account of decay. At that time, little attention was paid to mechanical wear, because ties were not only cheap, but usually had to be replaced because of decay before mechanical wear became an important contributory factor. With such conditions, protective devices to prevent mechanical wear could not be justified economically.

In the last 30 years, however, methods of treating wood to prevent decay have been so effective that crossties, properly treated and properly handled, will resist decay for 25 years or more. With this change, mechanical wear has become much more important and, to insure the full life of ties, studies have been made of the types and cause of mechanical wear and consequent tie failures. As the result of these studies, measures are being adopted to overcome or reduce these failures, and these measures will need to be improved and developed continually to meet varying conditions.

With the present effective methods of tie treatment, mechanical wear on ties accounts for more failures than decay, and the problem of protecting ties from this cause of failure has become one of paramount importance. Furthermore, the standard of maintenance being equal, mechanical wear and factors affecting or causing mechanical wear bear a rather direct relation to traffic. Failure by decay,

no doubt, bears some relation to traffic as most ties showing marked mechanical wear also show considerable decay, and it is often difficult to determine whether the decay was started by some form of mechanical wear, such as "plate-cutting," "spike-killing," etc., or whether the mechanical wear was caused by decay. More often the former is true.

## Types of Mechanical Wear

Softwood ties wear principally as the result of plate-cutting, rail-cutting, spike-killing and crushing. There is also some damage or loss of ties as the result of derailments and other accidental causes. The same conditions affect hardwood ties, with the added factor that they are much more subject to splitting than softwood ties.

According to one railroad, a study of 141,472 failed creosoted ties prior to 1940 showed the reasons for failure, in the opinion of the inspectors, as follows:

Decay .....	0.4 per cent
Shattered .....	47.6 " "
Plate-Cut .....	2.2 " "
Spike-Killed .....	44.4 " "
Split .....	2.4 " "
Deraiment .....	2.6 " "
Broken and Burned.....	0.4 " "
100.0 per cent	

Another railroad shows the principal causes for removal of 107,317 creosoted ties, during the period of 1927-42, as follows:

Decay .....	6.8 per cent
Crushed .....	24.7 " "
Plate-Cut .....	28.9 " "
Spike-Killed .....	6.0 " "
Broken .....	0.8 " "
Split .....	21.5 " "
Decay Under Rail Seat..	9.2 " "
Other Causes .....	2.1 " "
100.0 per cent	

From the foregoing tabulations, it can be seen that decay accounts for but a small proportion of the failures of creosoted ties, and also, that proper classification of the various causes of failures may be difficult to determine. It is true that in most cases where ties are reported as having failed because of various types of mechanical wear, decay is also present but, in most in-



W. T. Donoho  
Chairman

stances, such decay is the result of, rather than the cause of, the mechanical wear. Considering only those causes representing 20 per cent or more of the tie failures, the following items, depending upon conditions, are of most importance: plate- or rail-cutting, spike-killing, splitting, and crushing and shattering.

### Plate-Cutting

Plate- and rail-cutting are similar and tie plates were adopted to reduce them. However, because of inadequate design, some cutting still takes place, but on a much reduced scale. Rail-cutting is caused by the slight movement of the rail which takes place on the ties each time a locomotive or car wheel passes over the track. The rocking action of the rail causes a greatly increased load on the outer edge of the rail base, which crushes the wood fibers. A sliding motion of the rail is also present and causes the wood surface to be ground to dust. The combination of grinding and cutting, in time, wears a deep groove across the tie. As the groove deepens the process is hastened by moisture entering the wood fibers and causing decay.

### Spike-Killing

The spike-killing of ties may be described as the effect produced by the repeated pulling and re-driving of spikes alongside old spike holes in the tie. This weakens the tie and destroys its spike-holding power. As a spike is driven, some fibers of wood are cut or crushed and the movement of the tie under traffic continues to damage these fibers. Then decay sets in as the spike becomes loose and permits moisture to reach the interior of the tie. Spike-killed ties always show some evidence of decay.

Spikes must be removed and re-driven when regaging track, relaying rail, etc. Whenever a spike is removed, the driving of a treated tie plug in the old spike hole will improve the holding power of the re-driven spike as well as reduce the likelihood of decay starting in the interior of the tie. Thus, tie plugs are an important means of eliminating one of the causes of spike-killing. The use of tie plates, which has reduced the necessity for the frequent regaging of track, has further reduced the number of ties that are spike-killed. Spiking the tie plate independently to the tie also reduces the strain on the rail spikes and consequent spike-killing. Spike heads should not bear directly on the rail base, but, rather, should provide some allowance for vertical movement of the rail. This will re-

duce the uplift on the spikes and the consequent re-driving required. Frequent re-driving of spikes is not desirable.

An interesting example of spike-killing is cited by an experienced track man, who reports that on his territory, rail on curves had to be transposed or relaid every four months. The ties under these conditions, although in a subway and protected from the weather, gave a maximum service of about seven years, permitting 21 rail changes before they had to be replaced for spike-killing. Under the same traffic on the tangents adjoining these curves, many ties more than 20 years old were still in service. All of these ties, on both curves and tangents, had adequate tie plates and were well anchor-spiked. This example serves to bear out the argument that each pulling and re-driving of spikes is equivalent to a definite period of tie life.

### Splitting

The splitting of ties is not the result of traffic, but it is affected thereby. Normally, splitting occurs before a tie is treated, but if splits are not checked they may increase in size after treatment. Splitting is reduced by the use of anti-splitting irons, three types of which are recommended by the A.R.E.A. The general rule for applying anti-splitting irons to a tie which has begun to split is to place them across and at right angles to the split, and in a manner to cross the greatest practicable number of annular rings. Treating plants have experienced men who have been trained in the cause and prevention of tie splitting. These men watch all ties carefully for indications of splitting during their seasoning periods, and apply anti-splitting irons to the ties promptly as needed.

### Crushing

The shattering and crushing of ties are the result of overloading the wood fibers and are closely related, although shattering is probably caused more often by the added effect of impact on the wood fibers. Good track surface has much to do with reducing the shattering effect, and both shattering and crushing are best overcome by large tie plates which have an adequate bearing area.

### Tie Plates

Next to good line and surface, the development and use of tie plates have had more to do with the reduction of mechanical destruction of ties than any other one factor, and with-

out tie plates, even the maintenance of good line and surface would be much more difficult. The first tie plates, which were employed about 1890, consisted of square sheets of thin iron punched for spikes. These proved a disappointment, because they curled up along the base of the rail and failed to provide the protection expected. It was found, however, that they helped materially in holding the track to gage. Furthermore, they helped to brace the outside spikes against the spreading action of the rail, and by thus holding the track to gage, a great deal of respiking was avoided and fewer ties were spike-killed.

Following the first tie plate design, numerous special features were patented and, during a 20-yr. period, a single steel mill supplied as many as 5,000 different combinations of tie plate sections and punchings. Notwithstanding the fact that the principles underlying proper tie plate design are well established, railroads have been slow to adopt standard designs to meet the requirements for different wheel loads and weights of rail.

For a period of years most designs employed sharp ribs on the bottom of comparatively thin plates to obtain the increased stiffness against bending with the least weight of metal. It was also thought that these ribs would anchor the plate to the tie, permitting less motion between the tie and plate. A few years of service, however, showed that where sharp ribs were employed, the ties started to decay under the plates where the wood fibers had been damaged by them.

During this time, English railroads were using a cast iron chair securely fastened to the tie by bolts employed to hold the rail. No mechanical wear was noticed after 20 years of service, and it was decided that by using a flat-bottom tie plate, securely fastened to the tie, similar results could be obtained on American railways. The holding spikes were to be screwed into the tie through spike holes punched in the tie plate.

A series of studies and investigations conducted by the American Railway Engineering Association have shown that on one road, ties without tie plates were worn out after carrying only a fractional part of the traffic carried by similar ties properly tie-plated and still undecayed on another railway. The studies have also indicated that slight improvements in the design and application of many types of tie plates might even double the number of years that a treated tie will withstand a given volume of traffic.

Through various investigations, it has been fairly well established that

a properly designed tie plate should embody the following characteristics:

(1) It should have sufficient bearing area to prevent overloading the fibers of the wood.

(2) There should be a means of anchoring the tie plate to the tie securely enough to prevent its slipping on the tie as the loads pass over.

(3) There should be sufficient rigidity to prevent buckling or breaking under load.

(4) Shoulders should be provided on each side of rail to maintain it at gage, to distribute the thrust of the rail equally to all the spikes, and to prevent throat-cutting of the inner spikes.

(5) It should provide for proper balance of the load on it to avoid eccentric bearing and uneven settlement into the tie, with consequent variation of gage.

The use of tie plates between the rail and ties protects the ties from direct wear, but the ties are still subject to a grinding action, unless the tie plates are securely fastened to them. Tie plates that are not fastened rigidly to the ties by independent spikes, or by special rail-holding spikes that permit free movement of the rail, will grind or scour the tie. Likewise, a loose tie plate will hammer or pound the tie, causing shattering or crushing.

Aside from a generally high standard of maintenance, the proper seating and spiking of tie plates will reduce mechanical wear more than any single device. A high standard of track maintenance is also facilitated by the use of tie plates, but, to be fully effective, such tie plates must be properly designed in accordance with the requirements outlined in the foregoing discussion.

### Joints and Welded Rail

Joint ties represent about 16 per cent of the ties in use, and joint conditions cause the destruction of many of these ties. An inspection of track anywhere will show that the average age of ties under the joints is much less than that of the other ties. The use of six-hole joint bars in place of four-hole joint bars, to form a more rigid joint assembly, is recommended and used by some roads, while the use of continuous welded rail removes the trouble caused by joint conditions, both as it affects the tie and the pounding of the rail.

Rail anti-creepers play a very important role in safeguarding ties. Rail that is not anchored usually runs in the direction of traffic or down grade, and this should be prevented by providing it with a sufficient number of anti-creepers. Unanchored rail, or

rail that is held at joints with slot spikes only, destroys a vast number of ties. There is no less expensive or more practical way of saving ties than by stopping rails from running.

### Curves and Super-Elevation

Ties in curved track are subjected to more wear and tear than those in tangent track, and ties on sharp curves suffer more than those on light curves.



Clean Ballast, Large Tie Plates and Sufficient Anti-Creepers Greatly Reduce Mechanical Wear of the Ties

The tendency of traffic on curves is to spread the track and destroy the ties on the spike lines. The service life of ties on curves is further shortened by spike-killing caused by frequent ragging. Locomotives with long wheel bases or rigid frames accentuate this condition.

The minimum amount of super-elevation used on curves is that required to permit the fastest train to move over a curve with safety. Frequently the track is given more elevation than required by safety in order that the fast trains will traverse the curve with greater comfort. The result is too much elevation for the slower trains. On such curves, due to slipping and the additional load on the inside rail, the ends of the ties under the low rail are ruined long before the ends under the high rail. This condition suggests first, a reduction in curvature where such reductions are economical, and second, that the speeds of all trains should be as nearly equal as traffic requirements will permit. The use of adequate spirals on curves that do not have proper easements is also important, because the thrust on the point of a circular curve is a real cause for shortening the life of ties. The use of gage rods on sharp curves

will hold the track to gage and increase tie life.

General maintenance features which affect tie life unfavorably are such items as poor drainage, fouled ballast, instability of the roadbed, rough surface and poor alignment. A properly formed subgrade is a very important factor in the life of cross-ties. A wet subgrade is a soft subgrade and, under traffic, will cause ties to churn. Churning ties split and broom. Also, a wet subgrade frequently requires the use of mud or frost blocks to maintain a fair surface. Blocks on top of the ties mean more spike holes and more split ties.

Ballast should be clean and of a depth to properly distribute wheel loads to the subgrade. If the ballast is not deep enough to distribute the load, some individual ties, resting on a firmer support than others, will be unduly strained and possibly broken. In addition, an inadequate ballast section causes puddling of the track or water pockets, and this, in turn, has a destructive effect on the ties. In surfacing, it is very important to tamp the track so there will be no loose ties, and to surface it out of face before it becomes center bound. Center-bound track results in broken ties.

### Tie Renewals

Probably one of the most important single contributions to the extension of tie life is the realization by roadmasters and supervisors of their responsibilities in the matter of tie renewals. More than ordinary intelligence must be used in selecting ties for renewal, and in handling, storing and applying them.

Aside from the attention that has been given to the selection and treatment of ties, they have not been given a great deal of consideration. Much money is spent on rail and the maintenance of rail by building up joints, hardening the ends, etc., but most of the improvements that affect the mechanical wear of ties have come through efforts to protect rail and improve track riding conditions, while the ties themselves have been given secondary consideration. Since the cost of tie renewals represents such a large proportion of maintenance budgets, the causes of tie failures should be given greater consideration.

Committee—W. T. Donoho (Chairman), dist. engr., G.C. & S.F., Galveston, Tex.; J. E. Fanning, (Vice-Chairman), asst. to ch. engr., I.C., Chicago; F. G. Campbell, asst. ch. engr., E.J. & E., Joliet, Ill.; R. E. Cramer, research engr., U. of I., Urbana, Ill.; R. L. Fox, rdm., Sou., Alexandria, Va.; E. J. Haley, gen. rdm., A.C.L., Waycross, Ga.; C. H. Hardwick, engr. m. of w., C.R.I. & P., Chicago; A. J. Johnson, rdm., C. & N.W., Huron, S. D.; John B.



Kelly, gen. rdm., Soo Line, Stevens Point, Wis.; H. E. Kirby, asst. engr., C. & O., Richmond, Va.; L. M. Kuhn, supvr. R.F. & P., Fredricksburg, Va.; F. J. Meyer, ch. engr., N.Y.O. & W., Middletown, N. Y.; R. H. Milliken, rdm., C.P.R., Trenton, Ont.; P. F. Muller, rdm., C. & W.I., Chicago; Philip O'Reilly, trk. supvr., N.Y.N.H. & H., Bridgeport, Conn.; E. J. Ryan, trk. supvr., D. & H., Plattsburg, N. Y.; J. A. Rust, rdm., Sou., Winston-Salem, N. C.; Lee Spencer, Phoenix, Ariz.; A. W. Wehner, rdm., S.P., Lake Charles, La.

### Discussion

F. G. Campbell (E.J. & E.) read the report in the absence of the chairman. E. J. Brown (C.B. & Q.) explained that his road had introduced the use of anchor spikes for tie plates only recently and asked to what extent these were being used by other railroads and what results were being obtained. Explaining the practices of his road, J. T. Shepherd, Jr., (N. & W.) said that the Norfolk & Western had been using hold-down spikes for many years. The company uses cut

spikes for this purpose and generally applies a total of 8 spikes to each tie, including 4 line spikes and 4 for holding down the tie plates. The opinion on his road, he explained, is that hold-down spikes not only reduce plate cutting of the ties but also help to hold the track to gage. Referring to this latter statement, President Banion cited an instance that occurred on his railroad about three years ago in which, during the installation of flat-bottom tie plates on one division, the instructions for applying anchor spikes to these tie plates were overlooked. About 1½ years later, he said, he inspected this section of track and found that the gage was still in good condition.

W. H. Sparks (C. & O.) said that it had formerly been the practice on his road to use hold-down spikes in the form of lag screws and that, where they were used, the gage remained intact sometimes throughout the entire life of the rail. Discussing the splitting of ties, Mr. Sparks said that his road had tried various methods of preventing this but that none

of them had been effective where the traffic is heavy. He also emphasized the importance of drainage and clean ballast as a means of making ties last longer.

N. F. Alberts (C. M. St. P. & P.) said that his road had been anchoring spiking tie plates under 112-lb. and 131-lb. rail for 15 years and that good results had been obtained, especially in the elimination of regaging work. Mr. Brown expressed the opinion that if the use of hold-down spikes in tie plates will eliminate the grinding of the wood under them, serious consideration should be given the matter of using them.

Discussing the abrasion of ties under tie plates, G. E. Boyd (*Ry. Engr. & Maint.*) said that several years ago the American Railway Engineering Association published a monograph by Dr. Herman von Schrenk on the abrasion of ties under rails and tie plates. He explained that Dr. von Schrenk had found that the destruction of ties by abrasion was due largely to the absence of adequate anchorage of the tie plates to the ties.

## Mechanization of Section Gangs

### Report of Committee

THIS report is based on information received from 12 railways in the United States, which operate approximately 60,000 miles of line in different sections of the country.

Never before has there been so great a shortage of manpower in railway maintenance, compared with the need for labor, as at present, in addition to which selective service is taking many of our key workers. Furthermore, such labor as is now available for employment is greatly inferior to that to which we have been accustomed to obtain. For these reasons, the need for mechanized equipment is more urgent than at any time in the experience of maintenance officers. The only means available to offset, in some measure, this serious deficiency in manpower is to utilize to the limit the power machines now available and to purchase others to supplement and reinforce those now in use. We foresee this as a continuing problem of maintenance officers, for we believe that many of the men who have left the railways for war work, having once gotten a taste of the higher wages paid by industry, will not return to railway service.

In view of these conditions, it becomes incumbent on all supervisors to scrutinize carefully their gangs to

see that the work is being performed in such a way as to get the most done with the least labor. The only other alternatives to the use of manpower is the use of machine power. In the interest of the war effort we cannot afford to allow our tracks and structures to deteriorate, but must strive to improve them, to insure that there shall be no lack of transportation to

interfere with the movement of men and military supplies.

During the period of the depression, when money was scarce, it was necessary to maintain the track with the minimum of labor. Those roads that were able financially, purchased many power machines to replace the manpower they could not hire. Those roads were fortunate, indeed, which had a large complement of power machines and tools when the present emergency struck. Those who did not possess this equipment have found it difficult to purchase, and have suffered accordingly from their inability to offset the shortage of manpower.

### Keep Machines Busy

No road possesses all of the power machines that it needs, yet some roads are not getting complete efficiency from those they do own. Every machine should be worked to its fullest capacity; and they can often be transferred to other uses by small alterations in them. The work for each machine must be planned so as to keep it in productive work at all times. However, at present, with certain critical material unavailable, many machines are out of service because repairs cannot be made or re-



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Chairman



placement parts obtained. Many breakdowns are caused by improper and careless handling. Machines should be inspected daily and used as if they were our own.

On the 12 railroads represented on this committee, the maintenance of roadway machines is handled in much the same manner. The large machines, such as bulldozers, draglines, etc., are dispersed from a central point at which all heavy repairs are made. Only running repairs are handled on the division or district. The division keeps a limited supply of repair parts and depends on the central shop for replacements. The track supervisor on whose territory the machines are working is in complete charge of the machines while they are in his possession, and he plans the work to be done.

### Operators Responsible

The operator of the machine is responsible for its performance, and must see that it is used safely and carefully. He is classed as a machine operator and must be qualified to handle the machine in such a way as to not lose time because of breakdowns. Any time that the machine develops a defect that he cannot remedy, he should call on the division repairman. If the condition is one that the repairman cannot handle, he then sends the unit to the central shop. Because of the shortage of machines and of capable men to operate them, many machines are now working 10 and 12 hours a day to obtain full service.

The committee is also in complete accord as to small power tools which can be assigned to section gangs. These tools comprise spot tampers, pressure oil sprays, junior weed burners (for yards) and motor cars. However, some large section gangs are being transported in highway trucks, to avoid delays, and to insure more safe movement of the men.

Greater strides are now being made toward mechanized equipment than ever before. Manufacturers of power machines and tools are striving not only to fill their orders but to supply repairs for machines now in service. With the shortage of critical materials, this has become a major task.

### More Work Accomplished

The savings that can be made with mechanized equipment vary in accordance with the amount of such equipment and the intensity of its use. However, the committee is in agreement that a fully mechanized gang with the average amount of such tools will produce materially more work with less effort than a gang of the same size using hand tools.

The greatest improvement to section equipment since the motor car is the spot tamper. This machine is used more commonly in so-called hard ballast. It can be maintained almost wholly by the crew itself, and is easily transported from place to place. An average foreman can easily dismantle the unit and clean each part. He can renew piston rings and check tension in the engine springs. The entire cleaning and checking can be completed in 30 minutes. The number of these machines to be assigned to any section varies according to the particular needs of that section. This will depend, in turn, on the type of ballast, the size of the gang and the availability of the machines. At least two of the machines should be worked together. Some roads place two machines on every alternate section, and when the machines are at work the two sections double up their gangs. The best results are obtained where the machines are kept in the hands of experienced men, as the quality of work depends on uniform tamping.

Motor cars should be equipped to carry these tools so they will not become broken while being moved from one job to another, and to avoid any possibility of fuel leaking from the machines and causing a fire hazard.

### District Machines

The help received by section gangs from a wide range of district machines has been of real value. These machines keep their ditches clean, weeds cut, ballast clean, etc. The types of machines that can be assigned to advantage to each section are limited and are roughly as follows: (1) spot tampers; (2) power mowers, for station and yard gangs; (3) oxy-acetylene outfits (in terminals); (4) power drills (in terminals); (5) motor cars or trucks.

However, the use of power tools which work on individual sections, out from a division or district central point, are of equally great importance in maintaining the sections. Such tools include the following: (1) draglines; (2) ditchers and spreaders; (3) bulldozers; (4) on and off-track mowers; (5) rail grinders and saws; (6) bolt tighteners; (7) light rail cranes; and (8) ballast drainage cars. These machines, often operated by section crews, are not a part of their regular equipment, and are passed from section to section, and usually operated by district operators.

Certain small mechanized equipment can be placed economically on sections. However, the larger machines should be handled principally through a district schedule and under district supervision, both as to their

use and their movement from section to section as the various projects are completed.

T. O. Manion (chairman), div. engr., M. P., Little Rock, Ark.; Charles Weiss (vice-chairman), supvr., P. R. R., Valparaiso, Ind.; J. S. Anthony, supvr., Sou., Strasburg, Va.; C. E. Brown, rdm., P. & S. F., Slaton, Tex.; A. B. Chaney, dist. engr., M. P., Little Rock, Ark.; B. Clark, trk, supvr., C. & E. I., Watseka, Ill.; L. M. Denney (retired), supvr., C. C. & St. L., Indianapolis, Ind.; R. H. Gilkey, div. engr., C. of Ga., Savannah, Ga.; W. H. Haggerty, supvr., N. Y. N. H. & H., New Rochelle, N. Y.; L. V. Johnson, mtce. engr., Soo Line, Minneapolis, Minn.; R. Marshall, dist. rdm., G. N., Superior, Wis.; H. P. Mason, supvr., B. & M., Boston, Mass.; A. G. Reese, dist. mtce. engr., C. B. & Q., Galesburg, Ill.; J. C. Runyon, supvr., C. & O., Covington, Ky.; E. C. Shreve, div. engr., W. Md., Cumberland, Md.; T. N. Turner, rdm., M. P., Newport, Ark.; R. E. Vandivort, rdm., P. & L. E., Pittsburgh, Pa.; and John S. Vreeland, assoc. ed., *Railway Engineering and Maintenance*, Chicago.

### Discussion

In the absence of the chairman, this report was read by R. H. Gilkey (C. of Ga.). Answering a question put by F. G. Campbell (E. J. & E.), President Banion explained that the term "drainage car" as used in the report refers to such equipment as ballast scarifiers and discers. W. H. Sparks (C. & O.) took issue with that part of the report stating that "in the interest of the war effort" maintenance men "must strive to improve" the tracks and structures, pointing out that, in view of the present shortages of manpower and materials and the heavy traffic load being carried by the railroads, the best that they can do is to keep their properties from deteriorating.

E. E. Crowley (D. & H.), discussing that part of the report dealing with spot tampers, raised the question whether the text refers to unit gasoline-engine driven tampers or to electric tampers operated from a portable generator. It was explained that the reference is to tampers of the former type. N. D. Howard (Ry. Engr. and Maint.) explained the manner in which one road in the South operates and maintains the gasoline-engine driven unit tampers that it has placed in the hands of section gangs. He said that the procedure followed when such tampers are introduced on a particular section is for the supervisor of work equipment to demonstrate to the foreman the manner in which the tools are dismantled, cleaned and reassembled. This is a procedure which the supervisor of work equipment can perform in about 30 min., although, until experience is gained, somewhat more time is usually required by the foremen.

# Recruiting Men In the Face of a Labor Shortage

Report of Committee

DURING the current year the labor situation of the country has changed in several major respects, and particularly in those respects which affect the recruiting of the manpower required by the railways to carry on their essential operations and maintenance. Due to several factors, the labor shortage among the track forces eased somewhat during the height of the current working season, but it is still severe generally and critical in many areas.

A year ago at this time, with roadway and track operations still at a peak, the railways reported the manpower needs in the ranks of their maintenance of way and structures forces as approximately 52,260 men, with shortages in section and extra-gang men alone totalling 46,762. As of the beginning of the current year, with its curtailment of many maintenance activities, particularly in the northern part of the country, these needs were reduced materially, but during March they had already climbed back to a total of more than 52,000, which included 32,270 sectionmen and 10,637 extra-gang men. Since that time, due to several important influences, including the large-scale employment of Mexican Nationals and high school boys, the situation has eased somewhat, the latest figures available (August 1), as reported to the Railroad Retirement Board, showing the expressed needs of the railways for sectionmen as 27,812, and for extra-gang men as 9,184, a total of 36,996.

## Problem Still Serious

The recruiting problem of the maintenance of way forces will continue to become more severe or will ease only with changes in the overall labor supply of the country, and in the overall demand for labor for war production and other essential industries. Unfortunately, no one knows what these changes will be from month to month, and the uncertainty grows as the war situation in Europe comes closer to a climax. If that situation becomes more tense in the months ahead, it is certain that the demands on war industries on the home front, with corresponding demands for labor, will become more severe. On the other hand, when Germany collapses, there is certain to be a drastic cut-back in military re-



N. F. Alberts  
Chairman

quirements, which is equally certain to ease the labor situation on the home front. But until the collapse of Germany takes place, the railways must expect continued difficulties in meeting their manpower needs, and must continue every effort to secure as much labor as is essential to their requirements.

The fact that the end of the labor problem was not in sight late in June of the current year—in fact, was still becoming more critical—is seen in the statement of War Manpower Commissioner Paul McNutt, at that time, and the more drastic recruiting policies put into effect generally over the country on July 1. On June 23, Mr. McNutt emphasized that it will be necessary to maintain the nation's labor force at full strength between now and the end of 1944. "Despite an expected decline in total labor requirements of the munitions industries," he said, "it will still be necessary to place thousands of workers in critical industries and areas." He warned that there will be no easing of the national labor supply during this period, adding that every man and woman now employed will continue to be needed.

"During the period between April 1, 1944 and January 1, 1945," Mr. McNutt continued, "the chief drain on the nation's manpower will come through the induction of 1,400,000 men needed for the armed forces, while during that period it is estimated that only about 400,000 will be

returned to civilian employment. Until last autumn," he said, "the manpower problem was one of overall expansion of the labor force. This is no longer true. The problem now is one of male labor and of preserving the overall gains we have made by channeling workers laid off or otherwise separated from their employment into the activities in which they are needed most urgently. With the decline in certain types of production and the expansion of others," he said, "it is necessary to place much greater emphasis upon directing workers to places where they will contribute most in advancing the war effort. Above all," he pointed out, "it is necessary to prevent workers from accepting less essential work or from withdrawing from the labor force as long as their efforts are still needed."

## Priority Referral Plan

In the light of this situation, as outlined by Chairman McNutt, the War Manpower Commission, on July 1, 1944, put into effect what is known as the Priority Referral Plan of hiring labor, a plan which goes far beyond previous labor stabilization orders, the most drastic of which required that an employee in an essential industry, including the railways, must secure a statement of availability from his employer before he can be employed in another industry.

Discussing the Priority Referral Plan on June 25, just before it was put into full effect, Charles E. Wilson, executive vice-chairman of the War Production Board, pointed out the essentials of the plan as follows:

First—that it will establish a nation-wide system of priority referrals, which provides that employers shall hire male workers only from those referred to them by the War Manpower Commission, the United States Employment Service, or by a specially appointed agency.

Second—it will fix the number of men who may be employed in specific establishments in the 184 areas of labor shortage as defined by the War Manpower Commission.

Third—it will create area manpower priority committees which will determine which industries in their areas are entitled to priorities in the referral of available male labor.

Fourth—it will intensify the recruiting activities of the United States Employment Service and its agents so that men may be transferred from areas of labor surplus into those areas where urgent war production requires more labor.

### Effects on Railroad Employment

Under these broad principles of the plan, there are certain fundamentals as they pertain to the employment of labor by the railways. First, to the Railroad Retirement Board, subject to certain limitations, was designated the primary responsibility for the recruitment and placement of all railroad labor, acting for the railways in the same manner as the United States Employment Service acts with respect to the recruitment and placement of labor in other essential industries. Another fundamental of the plan is that it directs all railroads to place all orders for labor with the Railroad Retirement Board, and to make all hires through that Board. To the present time under the plan, ceilings on railroad labor, as such, have been placed by the War Manpower Commission only with respect to fixed facilities, such as shops and engine-houses in certain tight labor market areas.

Under these fundamentals of the plan as applied to the railways, there are many applicable modifications to meet special needs or conditions, but they all work to the end of directing available labor to the points of greatest need, of utilizing most effectively the skill or experience of each available worker, and of facilitating the smooth working of the plan in the interest of both the employer and the employee. Thus, for example, there is provision for the closest co-operation between the work of the Railroad Retirement Board and the United States Employment Service in seeing that men best qualified for railroad work are steered into that type of work, while men best qualified for other classes of essential work are directed to those classes of work in the areas where the need for them is greatest.

The Retirement Board keeps the U.S.E.S. advised of the manpower needs of the railroad industry, so that applicants interested in and qualified for railroad employment can be referred to the Board. The U.S.E.S., on the other hand, keeps the R.R.B. informed of high priority non-railroad orders on which the Board refers qualified applicants who cannot be referred on a railroad order with an equally high priority.

The most important fact concerning the Priority Referral Plan as it af-

fects the recruiting of labor by the railroads, is that it calls for the hiring, or the referral for hiring, of all railway labor through the Railroad Retirement Board. This covers all male labor, including high school boys, except as certain age limits are excluded in certain areas, and also includes women in some categories and areas.

Normally, all applications for hires must be made in person before one of the regional or local offices of the Retirement Board, but to overcome the difficulties, delays and travel which this would entail in the case of areas far from offices of the Board, several special arrangements have been set up. One of these is that in any area in which the Retirement Board does not maintain an office, the United States Employment Service serving that area will assist in handling both requests for employment for the Board, and in recruiting railroad workers at the request of the Board—always referring all transactions, however, to the Board.

In outlying districts where neither the Railroad Retirement Board nor the United States Employment Service has a representative, and where it would be impracticable for employees to secure referral from either agency because of distance and location, the Railroad Retirement Board has been authorized in most areas to make arrangements with the railroads to hire such employees "at the gate," subject to subsequent clearance with the Railroad Retirement Board of all such hires within a specified period from the date of hiring.

On August 4, War Mobilization Director James F. Byrnes issued a directive which intensified the provisions of the priority referral plan. In general, this directive provides for the assignment of ceilings for a greatly increased number of industries and the use of all legal measures at the command of the WMC to enforce compliance with WMC stabilization and priority referral plans. The directive states that the responsibility

for manning war plants producing materials essential to the prosecution of the war rests with the communities in which such plants are located, and that, if necessary, the ceilings for less essential industries will be lowered to the point where such industries will actually lose employees for the benefit of employers producing essential war goods.

The intended effect of this directive emphasizes the importance of obtaining appropriately high priority ratings for labor, since the ceilings established will be dependent largely upon the priority assigned. As stated previously, however, as far as the railway industry is concerned at the present time, ceilings are being placed only on certain fixed facilities in certain areas. This directive, therefore, affects directly only such fixed facilities.

Obviously, all clearances given by the Railroad Retirement Board in the hiring and placement of workers are in accordance with previous stabilization orders of the War Manpower Commission, as amended, including those dealing with the necessity for statements of availability by applicants for jobs who are transferring from one essential industry to another.

While the foregoing gives little more than a brief outline of the Priority Referral Plan now in effect as it applies to the recruitment and hiring of railroad employees, it does indicate the important place of the Railroad Retirement Board in the picture and the importance of co-operating with the Board in every way possible. It should be made clear that the Board is not only a servicing organization, but is in a position to conduct, and has already conducted, extensive recruiting campaigns, either through its own widespread representatives, or with the aid and co-operation of the United States Employment Service in areas where it does not have representatives. In fact, it is prepared to send special representatives into areas where it does not have of-

Mexican Nationals Have Helped Materially to Fill Out Large Extra Gangs on Many Roads During the Last Two Years





fices to co-operate with the railways in recruiting men and in servicing applications for employment under provisions of the Priority Referral Plan.

### Mexican Nationals

The railways, confronted with the loss of thousands of employees to the armed services and to other industries, have made strenuous effort to maintain their forces to the required level to carry out the work that is essential to the war effort of the country. Nowhere has this been more pronounced than in respect to their roadway employees, both through their own efforts and in co-operation with government agencies.

One of the most important factors in easing the manpower shortage in the roadway department has been the importation of Mexican Nationals, and their employment to date on 30 railroads of the country in numbers ranging up to more than 17,000. Following negotiations between the State Department, the War Manpower Commission and the Mexican Government, the first agreement covering the importation of Mexicans for work on the American railways provided for the entry of 6,000 unskilled workers for employment as track laborers on the railways of the Southwest and Pacific Coast states. Announcement of this agreement was made by the War Manpower Commission on May 1, 1943, and recruitment of the workers began in Mexico City about May 10. Subsequently, about the middle of June, 1943, the ceiling on Mexican entries for railroad work was raised to 20,000, then to 40,000 in March, 1944, and still further, after further urging on the part of the railways and further negotiations on the part of the State departments of the two countries, on July 5, to 50,000, where it now stands.

Taking advantage of the relief certain in the employment of these importees, road after road has availed itself of the opportunity to hire them, including a number in the East and North which have never employed Mexicans before. To date (August 1), the requests of the railroads for Mexican laborers have exceeded 95,000, and allocations have been made to the different roads, on the basis of a temporary ceiling for each road, to the limit of the importation quota.

Limitations placed upon the extent of this report will not permit discussing the Mexican labor situation further, but for those interested in this situation as it existed in June, 1944, and the details of the agreements under which the Mexicans are being brought into the country and are being hired by the railways, reference is

here made to an article which appeared in the issue of the Railway Age for June 10, 1944, page 1112.

### High School Boys

The employment of high school boys by the railways for track work during their summer vacation period, and on week-ends and holidays both before and following this period, has also been an important factor in easing the labor situation on the railroads. This employment of boys, started in 1942 on a few roads, gained impetus rapidly during 1943, until boys were being employed widely over the roads of the country and, at the peak of the 1943 summer season, reached a total number estimated at approximately 10,000. Carrying the program still further during the current year, figures compiled by the Railroad Retirement Board show that between May 1 and August 1, the railroads had hired 20,702 high school boys, most of whom were then working on the track.

While most of the credit for this large enrollment of students in track work is due to the foresight and initiative of the railroads themselves, much of it, especially during the current year, is due to the efforts of the Railroad Retirement Board, which early in the year instituted a promotional and educational program designed to interest high school boys over the country in work on the railways. Under this program, which has been conducted by its representatives in each of its nine district offices, it has contacted railway officers and state and local authorities to appraise them of the plan and to solicit their interest in it, and has also sought the co-operation of the regional, state and area directors of the War Manpower Commission and the local officers of the United States Employment Service. These efforts have been supplemented by poster and bulletin campaigns reaching down into the high schools themselves, and by the use of motion pictures, which showed the highlights of the work involved, and the housing and social activities of groups of boys employed during the 1943 season.

The employment of these boys has demanded special consideration in some instances in the way of housing, transportation, food, and work operations themselves, but reports from many roads indicate that the boys generally apply themselves diligently, and are accomplishing a vast amount of essential work which could not otherwise be done. In fact, many reports have been made indicating that the production and quality of the work done by boy gangs approach or

equal that done by gangs of older men.

Continuing their efforts to overcome their shortage in manpower, a number of railways have employed women in maintenance operations, although there has always been general recognition of the fact that roadway maintenance work is essentially work for men. Whereas in January, 1943, 745 women were employed in maintenance of way and structures operations, other than clerical and as crossing watchmen, by the Class I railroads, this number increased to 3,027 in October of that year. Dropping off during the winter months, as might be expected with the seasonal character of many maintenance operations in the North, the employment of women has again been on the increase, until latest reports, as of April 15, indicate that at that time 2,563 women were in the employ of the Class I roads in maintenance of way and structures work, exclusive of those employed in offices and as crossing watchmen. This number included 1,397 women classified as sectionmen and 1,166 as extra-gang workers.

### Methods of Recruiting

The many and various methods that have been employed by the railways to recruit labor during the present emergency are a matter of record, having been discussed at length and repeatedly in previous reports to this association, and in reports made to the American Railway Engineering Association and the American Railway Bridge and Building Association. Therefore, no attempt will be made here to other than refer briefly to them and to offer such comments on them as may be warranted by present labor conditions and present regulations governing the employment of workers.

Among the various methods are the employment of advertising in local newspapers, the use of posters in station buildings and the personal efforts of agents and other employees; the maintenance of close contact with local employment agencies; the employment of special labor recruiters; and the closest co-operation between various departments on individual roads, to see that applicants for jobs in one department are not turned down because of lack of adequate qualifications, without referring them to other departments where their qualifications might be entirely adequate. In fact, in this latter regard, some roads, with considerable success, have established central hiring offices which hire for all departments.

Still other methods employed to enlarge the labor supply of the maintenance of way forces include the



employment of week-end workers; the lowering of age requirements and the raising of age limits; the lengthening of working hours to nine or ten, to permit employees to earn larger over-all weekly wages; the improvement of camp housing and boarding conditions to attract labor and to assist in holding such labor as is employed; and the year around programming of work to a greater extent than ever before, in the North as well as the South, as an inducement to new workers and to avoid the loss of present workers through constant turnover.

All of these methods in the recruiting and holding of employees have been important factors in the past and have had a marked effect in holding maintenance of way employees to the level that has prevailed. Today, most of them are just as important factors as at any time in the past, any element of the recently instituted Priority Referral Plan to the contrary. This plan sets up certain procedures for and restrictions on the hiring of new employees, but it is just as important as ever before, if not more so, that the railways utilize every legitimate means to apprise unemployed labor of their needs, and to attempt to interest it in accepting railroad work.

Thus, advertising should continue, contacts with local employment agencies should continue, the use of special recruiting agents, working with the Railroad Retirement Board, should continue, the co-operation of all departments in hiring men should continue, and every effort should be continued to make work in the maintenance of way department as attractive as possible, both in the interest of securing new employees and to hold those who are already employed. The only essential fact to keep constantly in mind in all of these efforts is the provision of the new Priority Referral Plan which requires that all hires be made with the knowledge and consent of the Railroad Retirement Board or its designated agents.

[This report was accepted without discussion.]

Committee—N. F. Alberts (chairman), gen. fore., C. M. St. P. & P., Chicago; Neal D. Howard (vice-chairman) managing editor *Railway Engineering and Maintenance*, Chicago; E. J. Brown, engr. of trk., C. B. & Q., Chicago; B. S. Archibald, rdm., Ban. & Aroos, Derby, Me.; M. D. Carothers, ch. engr., Alton, Chicago; M. L. Denney, trk. supvr., Indianapolis Union, Indianapolis, Ind.; F. L. Etchison, gen. rdm., A. C. L., Rocky Mount, N. C.; John M. Fahey, rdm., C. & N. W., Winona, Minn.; F. C. Fisk, supvr., Erie, Hornell, N. Y.; H. B. Hoyt, trk. supvr., B. & O., East Salamanca, N. Y.; P. L. Koehler, div. engr., C. & O., Ashland, Ky.; W. A. Mo-

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enr. m. of w. & s., Sou., Charlotte, N. C.; R. T. Spaulding, trk. supvr., B. & M., Worcester, Mass.; and W. P. Wiltsee, ch. engr., N. & W., Roanoke, Va.

## The Track Supply Association

OBVIOUSLY, in view of the decision of the Executive committee of the Roadmasters' and Maintenance of Way Association to forego the regular annual meeting of the association and to hold in its stead a one-day meeting of the Executive committee, the annual exhibit of products by the Track Supply Association became impractical. In fact, it is questionable whether, in any event, such an exhibit could have been held at this time which would have served adequately the members of the Roadmasters' Association who might have attended a regular meeting, because many of the manufacturers who have showed their products in previous years are so involved in the production of military equipment and supplies.

During the entire history of the Roadmasters' Association, supply manufacturers, through their exhibits, have been of real service to those members of the association who have attended its annual meetings, the latter having profited greatly by reason of the opportunity afforded them to study the actual machines, appliances and materials that were available and specially adapted for their needs. For more than a third of a century, since the organization of the Track Supply Association, the mutual respect and co-operation between the two associations have been of definite profit to both. As an indication of the value that the roadmasters place on the track supply exhibit, they have always, in the selection of the places for their meetings, included the requirement that accommodations for an exhibit must be available.

The officers of the Track Supply Association who have carried on its activities since the last exhibit, two years ago, and who have been retained in office for the coming year are: President, H. C. Hickey, The Rail Joint Company, Inc., Chicago; first vice-president, H. M. McFarlane, O. F. Jordan Co., East Chicago, Ind.; second vice-president Thomas D. Crowley, Thomas D. Crowley & Co., Chicago; secretary, Lewis Thomas, Q & C Company, Chicago; directors, F. A. McGonigle, Mall Tool Company, Chicago; L. I. Martin, Morden Frog & Crossing Works,

Chicago; H. A. Morrison, *Railway Engineering and Maintenance*, Chicago; R. M. Blackburn, Buda Company, Chicago; C. B. Armstrong, Air Reduction Sales Company, Chicago; C. O. Jenista, Barco Manufacturing Co., Chicago; and J. B. Templeton, Templeton, Kenly & Co., Chicago.

## A Message from the President and the Secretary

Since, for the second consecutive year, the Track Supply Association did not have an opportunity to display the equipment, appliances and materials produced by its members, because the Roadmasters' and Maintenance of Way Association believed it to be inadvisable to hold its regular annual meeting, we welcome the privilege of joining the Roadmasters' Association in this Convention-in-Print issue of *Railway Engineering and Maintenance*.

Last year was one of intense activity on the part of our members in their efforts to meet the needs of the army and the navy and, at the same time, to keep necessary materials moving to our railroads to aid them in functioning effectively under the greatest traffic load in their history. At present, our organization is comprised of 70 firms, an increase in membership that shows that our companies realize the opportunity to be of service to the railways, both at present and in the post-war period.

During the year, our board of directors has held only such meetings as have been necessary to keep the association active and to prepare for the time when we will again be able to hold our regular exhibitions in close co-operation with the Roadmasters' Association, to insure that we will be of maximum service to its members. The officers and directors of the association are looking hopefully to the time in the not distant future, when hostilities will cease and when our association will again be able to join with the Roadmasters' Association in a resumption of our normal activities.

# Maintaining Water Service Facilities—

## Deep Well Pumps

By C. R. Knowles

Superintendent Water Service (Retired)  
Illinois Central, Chicago



Left—A Deep Well Submersible Pump

IN common usage the term deep well is applied to any well of relatively small diameter in which the water level is beyond the suction lift of a surface pump. It follows that any pump placed in a well at a level within suction reach of the water may be termed a deep-well pump, and it is in that sense that the term is used here. It should be understood that it is not the intent to include the conventional type of surface pump in this category, even though such pump may be located in pits or shallow dug wells.

Deep-well pumps as used in railway water service come under three general classifications: (1) Reciprocating or plunger pumps, (2) centrifugal or turbine pumps, and (3) air lifts. It is estimated that there are more than 12,000 deep-well power-driven pumps in service, exclusive of hand and windmill-driven pumps used for supplying water at stations, section houses, stockyards and similar points.

### Reciprocating Pumps

Power-driven deep-well reciprocating or plunger pumps follow the same general design as hand-operated well

pumps, although they are larger, have a longer stroke as a rule, and are much heavier in construction. The water cylinders of power-driven deep-well plunger pumps are generally termed working barrels. They follow the same general principle of the ordinary horizontal direct-acting pump in their operation, the principle difference being in the packing and arrangement of valves.

The cylinder or working barrel may be single-acting, in which case the water is discharged only on the upstroke of the piston, or it may be double-acting, discharging on both the upstroke and the downstroke. In the latter case an upper and a lower-working working barrel and two plungers are involved, but these can be operated with a single line of rods. Another type of double-acting pump has two pistons or plungers in the same working barrel, each operating by separate rods working in opposite directions. One of these rods is solid and works inside the other, which is hollow, the solid rod being connected to the lower piston and the hollow rod to the upper piston. This type of pump requires a special power head with double cranks or cams.

The working barrels are of two general types, designated as cased and plain. The cased working barrel is encased in a section of standard pipe of the required size and length, the pipe being threaded on each end so that it can be attached to the drop line and footpiece. The plain working barrel on the other hand is so constructed that it can be swaged in place in the well casing, thus eliminating the necessity for a drop line. This type of barrel is adapted to wells of small diameter where the use of a drop line is not feasible. The working barrels are made in various sizes ranging from 1-11/16 in. to 11-3/4 in. inside diameter, and from 6-in. to 36-in. stroke.

Wooden pump rods with threaded connections are desirable where sin-

gle rods are used, although rods constructed of pipe are also used, the object being to make them as light in weight as possible consistent with the desired strength. The maintenance of rods is an important feature in maintaining deep well pumps, and wooden pump rods should be carefully selected and maintained. Second growth clear straight Northern ash is used for rods, where obtainable, but hickory will prove satisfactory. All rods should be sawed with the grain and air dried. It is always desirable to keep spare rods on hand for replacements in case of breakage. Wooden rods should be kept dry and stored so that they will not become warped or bent. The screwed connections on the ends of rods should be well fitted and applied in such manner that the string of rods as screwed together is in a perfectly straight line. When fitting rods to the required length, the water service repairman should maintain a slight tension on the string of rods to prevent sagging. This is of particular importance where a long string of rods is used.

### Operating Problems

Good operation requires that the rods be of the correct length. To secure the desired length, the plunger should be raised to provide the required clearance above the foot valve, to avoid striking it. At the same time, sufficient clearance should be provided at the top to prevent the plunger from coming out of the barrel on the upstroke. The adjustment to final correct length may be made by using a short length of wooden rod or pipe as required. Pipe rods may be cut and threaded, using line pipe couplings with recessed ends to secure added strength and stiffness. Rods should be of ample size to minimize whipping. Guide couplings are sometimes used on long lines of rods.

To compensate for the unequal load common in single-acting pumps, a dis-

placement plunger is used with direct-acting steam pumps. This displacement plunger ranges in size from 2 in. to 4-3/4 in. and forms a part of the rod assembly. It passes through a packing gland at the base of the power head and acts as a secondary piston, displacing the water on the down stroke and creating a partial vacuum on the upstroke.

The renewal of cup leathers is a matter of routine maintenance and must be done at fairly regular intervals. The frequency of renewal will be governed largely by the number of hours the pump is operated and the amount of sand carried by the water. Excessive wear is indicated by a reduction in the amount of water delivered by the pump, which should become readily apparent to the pumpman and the water service repairman.

Cup leathers should be well shaped, of the correct depth, and be well fitted to the cylinder and piston. A shallow cup will have insufficient bearing surface, will wear rapidly, and may buckle, while one with too much depth may cause excessive friction and will have a tendency to increase the wear on the cup leather, the cylinder and the piston. Cup leathers should be of a good quality. A good oak-tanned or chrome-leather cup is to be preferred as it will wear much longer and give better service. Composition cup leathers constructed of rubber and fabric have given good service. The cost of the cups is of secondary consideration when compared to the cost of pulling the rods and pistons for renewals.

Where the water is used for drinking purposes, the water service repairman should sterilize cup leathers in a solution of hypochlorite of lime before applying them, to avoid the possibility of contaminating the water. It is also advisable to apply hypochlorite of lime to the well when making repairs of any kind.

The renewal or repair of working barrels necessitates pulling the drop line, where cased working barrels are used, or pulling the barrel only, where plain working barrels are used. Plain or inserted working barrels sometimes adhere so tightly to the well casing that it is often necessary to use a splitting tool to remove them. These splitting tools may be obtained from well supply houses, or from some well drilling contractors, either through purchase or on a rental basis.

Working barrels ordinarily give little trouble and have a fairly long life where the cup leathers are maintained in good condition, but will wear very rapidly if the water carries sand. It is advisable, therefore, to correct sanding conditions promptly to avoid maintenance trouble.

## No. 7 of a Series

This article describes the three general types of pumps used in railway service for securing water from deep wells, and the problems encountered in good operation and maintenance of such pumps. Other articles of the series, which will appear in later issues, will discuss miscellaneous types of pumping equipment, and power units and transmission and control for the various types of pumps commonly used in railway service

It is desirable also to maintain a section of pipe, termed the foot piece, below the working barrel. This decreases the turbulence of the water as it enters the cylinder and tends to prevent the influx of air where there is a heavy draft on the well. The foot piece should preferably be a size smaller than the drop line. The length is optional, except where the capacity of the well is limited. If the depth of the well will permit, it should be 30 ft. long or beyond the practical suction life to prevent the pump breaking suction and air entering the pump. It is desirable that the working barrel be located below the static water level to insure its being filled with water when starting the pump. The water service repairman should check the static water level and the draw-down occasionally to determine any changes that may have taken place in the condition of the well.

Pulling drop lines and rods from wells for necessary repairs is a task that requires skill and extreme care. Only careful experienced water service men should be employed in such work. Makeshift tools and equipment should not be used. The cor-

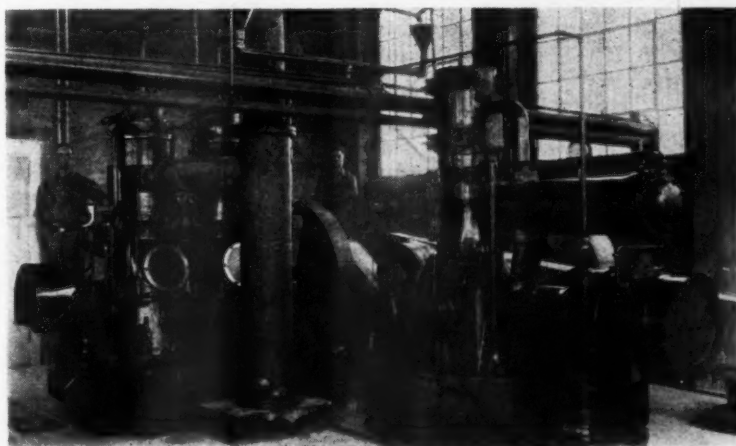
rect tools include pipe wrenches of suitable kinds, special rod wrenches, pipe elevators, rod swivels, the necessary clamps and, where rods are broken, a rod puller. The employment of careless men and makeshift tools invites trouble, and may result in personal injuries and possible destruction of the well. Where long drop lines are to be pulled, the additional weight of the water in the pipe may be objectionable. To overcome this the foot valve may be pulled to let the water out of the pipe. It is sometimes the practice to drill a small hole in the drop line just above the working barrel to permit the water to drain.

The majority of the valves used in reciprocating deep-well pumps are of the flat-rubber-valve type with a suitable spring. Spool and ball valves are also used in many installations. For pump settings greater than 200 ft., valves of special composition should be provided, because of the higher pressures. Deep pump settings also require more attention because of the pressure and length of rods, and as a rule, the pumps should be operated at a slower and more uniform speed. The pumper should regulate the speed of the pump so that the rod or piston speed does not exceed 60 ft. per min. under ordinary working conditions. However, the length of stroke, depth of setting and size of pump are all factors to be considered in determining the correct speed of the pump.

## Turbine Pumps

The deep-well turbine pump is a multi-stage centrifugal pump designed for use in the limited space available in deep wells. While these types of

A Large Railroad Air-Lift Pumping Installation, Showing the Oil Engine Power Unit at the Left and the Air Compressor at the Right





pumps are a comparatively recent development, they are now designed to meet pumping conditions found in practically any well, and are rapidly displacing other types of pumps except those where a very small rate of delivery is required. They are also used to a considerable extent in pumping from streams, dug wells and sumps, and for other applications where large quantities of water are pumped. They are particularly adapted to use where there is a wide range in water levels, thus eliminating the use of deep pump pits.

A deep-well turbine pump consists essentially of the following major parts: (1) The pump bowl assembly, (2) the discharge column, sometimes called the drop line, (3) the line shaft from power unit to pump, (4) the shaft tube enclosing the shaft (where used), (5) the discharge head, and (6) the shaft bearings.

Almost any form of drive can be used with deep-well turbine pumps, but these pumps are best adapted to the vertical electric motor, as it can be connected direct to the pump shaft and does not require any provisions for a change in speed. They can be used with a belt drive, either by using a quarter-twist belt or a right-angle drive. They can also be driven by an internal-combustion engine or other prime mover direct connected to a right-angle drive. The right-angle drive may be provided with a gear increaser to secure the necessary speed required for the operation of the turbine. One type of deep-well turbine is termed the submersible type, where the motor is placed in the well below the pump, thus eliminating the necessity for a shaft from the surface to the pump.

The advantages of a pump of this type are that it will operate successfully in crooked wells and no drive shaft is required, practically eliminating bearing problems. It is also possible to operate a submersible pump at higher speeds than with a drive shaft. Lubrication problems are also simplified as the lubricating oil is carried within the motor case.

A deep-well turbine requires little more than routine maintenance, if properly installed and operated. However, there are a number of fundamental principles affecting the pump installation that are vital to its successful performance. Among these are, the condition of the well, the submergence of the pump, and the character of the water.

### Special Problems

A turbine pump will not perform in a satisfactory manner if installed in a crooked well, as it is designed to

## The Water Service Series

The six articles in this series, published previously, include the following:

- (1) Introduction (April issue)
- (2) Sources of Supply—Streams, Lakes, Springs and Reservoirs (May)
- (3) Sources of Supply—Wells (June)
- (4) Sources of Supply—Pollution of Wells, Intakes, Suction Lines, Pump Pits, Ice (July)
- (5) The Maintenance of Pumps—Reciprocating Pumps (August)
- (6) The Maintenance of Pumps—Centrifugal Pumps (September)

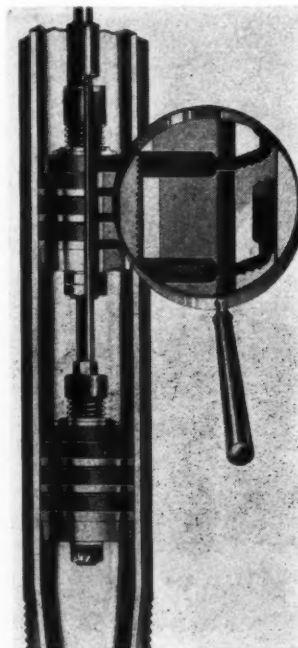
operate in a vertical position with all parts in perfect alinement. The pump should hang freely, without cramping, as any misalignment will set up strains in the shaft and cause continual trouble in operation and eventual damage and failure. If the well is not too badly out of line, a smaller turbine pump may be used, or a submersible type pump or an air lift system can be installed. The well should be fully developed and the water should be free of mud or

sand before the pump is installed. If for any reason it is necessary to use the pump before the well is fully developed, the discharge should be throttled until no sand is delivered with the water. The slightest amount of sand or grit in the water will have an erosive effect on the pump and will reduce its efficiency and shorten its life. If it is found that the pump is pumping sand, the pumper should notify the water service repairman at once and should slow the pump down until the sand fails to show. If the pump is stopped with a full discharge, the sand will settle in the bowls, around the impellers, and will cause them to bind so that they will not turn. This may result in badly damaged impellers or a broken shaft.

The correct submergence of the pump bowls is essential to the good operation and life of a turbine pump and should be watched closely by the supervisor and water service repairman. Insufficient submergence may cause the pump to break suction, result in excessive vibration and cause damage to the pump. On the other hand, the pump will operate with a suction life where a foot valve is used and ample provision is made to prime them, as, for example, when pumping from streams or other surface supplies. However, the best operation will be obtained and the danger of running the pump dry will be avoided when the upper bowl of the pump assembly is submerged.

As a general rule, the pump should have a submergence of 10 ft. or more. This is of particular importance where the pump delivery is near the capacity of the well. Where the pump is used in a reservoir with a constant head, or in a well where the drawdown is negligible, the submergence may be as low as 12 in. The water service repairman should check the submergence from time to time as the level of the water in the well may change through the lowering of the water table, or by the proximity of other wells. Furthermore, it may be affected by clogging of the screens or water bearing strata. Such conditions will become apparent to the pumper through the operation of the pump as the amount of water pumped will decrease and the pump will be less efficient. In addition, air will enter the suction, causing excessive vibration.

If the delivery of the pump is in excess of the amount supplied by the well, the pump delivery should be throttled until the condition is remedied. Where the trouble results from a lowering of the water table, the pump may be lowered to secure the required submergence, provided the capacity of the well is sufficient.



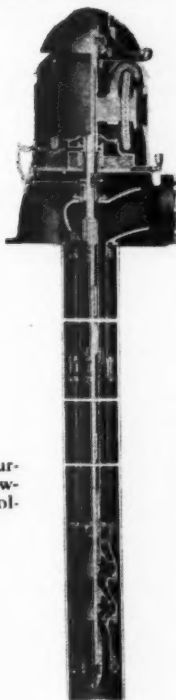
Showing in Detail, Pistons and Working Barrel of a Double-Acting Reciprocating Deep Well Pump

If the pumping head is increased materially as the result of the lowering of the water level, it may be necessary to add additional stages to the pump. Where the trouble is caused by incrustation or clogging of screens and the water bearing strata, the well should be cleaned and the flow restored. Such conditions necessitate a careful investigation by the supervisor. Under no circumstances should the pump be allowed to run dry, because, by reason of the limited clearances, the impellers may seize and cause serious damage.

The character of the water will affect materially the life and efficiency of the impellers and bowls, and to a less extent the shaft and column pipe or drop line. It is not always possible to predict the corrosive action of the water from a chemical analysis, as the high velocity of the water through the pump, together with the effect of air or other gases, may develop a corrosive or oxidizing effect not shown by the water analysis. Where waters may have a corrosive effect on the pump, the pump should be inspected at frequent intervals in order to provide for any renewals that may be required, and, if necessary, other less corrosive metals should be substituted. The bowls are usually constructed of cast iron, and the impellers of cast iron or bronze, but it may be advisable to use special metals where the water has a deteriorating effect on these parts. The presence of air or gas in the water in any appreciable amount not only causes corrosion but may also collect at certain points causing an unbalanced condition with resultant damage from vibration. Special provision should be made for handling waters at temperatures above 90 deg., F.

When a deep-well turbine is shut down, the water in the column pipe will flow back into the well, causing the impellers to rotate in a reverse direction. The pump should not be re-started until this reverse rotation ceases, because to do so will place undue strain on it, resulting in the possibility of a broken shaft or other damage. Where the pump is automatic in operation, a time-limit relay should be installed to prevent its starting before it has ceased to rotate in the reverse direction. Where a check valve is used in the discharge line, a partial vacuum will be created in the column and the reverse rotation will be prolonged. To prevent this, a small check valve should be placed in the discharge line between the pump head and the main check valve to permit air to enter the column pipe as the water flows back into the well. This will reduce the time the pump is in

A Deep Well Turbine Pump, Showing Shaft and Column Pipe



reverse rotation by permitting the column line to empty quickly. This is of less importance where submersible pumps are used.

Deep-well turbines may be either oil or water lubricated. Where oil is used, the bearings are usually lined with bronze and the line shaft is enclosed in a shaft tube. The oil is applied to the bearings by means of a sight-feed oil reservoir located on the surface at the base of the discharge head. In some cases a solenoid oiler is used, the solenoid automatically opening and closing a needle valve as the pump starts and stops. The pumper should adjust the oil feed to deliver the oil to the bearings according to the manufacturer's recommendations. The amount of oil required will depend upon the length of the line shaft and the number of bearings.

To insure adequate lubrication at all times, the pumper should give special attention to the oiling system. Oil lines, needle valves and oilers should be kept clean and the oil reservoir should be refilled before the supply is entirely exhausted. Oil in thrust chambers should be changed at regular intervals, depending upon the hours of service.

The shafts of water-lubricated pumps are not enclosed in shaft tubes. The bearings are lined with rubber or plastic and are lubricated by the water as it passes through the column pipe or, in some cases, through regular oil lines which carry the water of lubrication to the bearings. If a

water-lubricated pump is allowed to stand idle for some time, the shaft and bearings should be thoroughly wetted before the pump is started. Many cases have occurred where dry rubber bearings have seized the shaft. This would not have occurred if the shaft had been wetted before starting the pump.

The comparative merits of oil and water lubrication is a controversial subject. The oil-lubricated design may possess some advantages over water lubrication; however, the fact must be recognized that water will frequently rise inside the shaft tube of oil-lubricated pumps, and a portion of the shaft then becomes water lubricated until the water flows out as the water level is lowered in the well, and is replaced by oil. Most oil-lubricated pumps have a weep hole which allows the escape of the water that may accumulate inside the shaft tube, but these openings may become clogged to the extent that they do not function. No doubt, many oil-lubricated pumps are, in reality, water lubricated without the knowledge of the pumper—especially that portion of the shaft below the static water level in the well. To avoid this condition, the pumper should give the lubrication system particular attention.

The removal and installation of turbine pumps in wells calls for special skill and care, and should be done by a water service repairman experienced in well work, as carelessness or incompetence in handling the work may easily result in serious damage to both the well and the pump, even to the extent of completely ruining both. All parts of the pump are closely machined and fitted to very limited clearances, necessitating care in assembling them. The column pipe sections, shaft tube, shaft and bearings should be thoroughly cleaned when replacing the pump in the well. All dust and dirt should be removed from the oil lines, shaft tubes and column pipe. The shaft and bearings should be wiped clean with clean waste or wiping cloth. Extreme care must be used in placing the shaft in the tube to avoid injuring the bearing surfaces and threads. Care must be used also to avoid springing the shaft when placing the shaft and column assembly in position. The column pipe and shaft sections should be numbered or otherwise marked in the order in which they are removed from the well, and they should be replaced in the same sequence. All joints should be tight, but water service repairmen should be careful to avoid damage to the shaft sections when putting them together. Pipe wrenches or long handled wrenches should not be used for this purpose. A 12-in.

wrench is heavy enough for shafts up to 1 1/4 in., and an 18-in. wrench is heavy enough for larger shafts. If any burrs or rough spots are left on the shaft by use of the wrenches, they should be carefully removed as they may come in contact with the bearings with resultant damage. Shaft tubes and threaded column piping should be screwed together tightly, but the use of wrenches larger than those necessary should be avoided. The length of shaft and tubes should be checked as installed, to guard against any increase or decrease in the length. The length of the shaft should not vary where the ends butt together. A good lubricant is required for threaded connections. White lead may be used, but it will make it difficult to take the joint apart. Experience has shown that a pipe lubricant containing graphite is preferable to white lead or paint.

Screwed columns require special care in re-assembly; they always tend to shorten because the joints are screwed a little tighter each time they are taken apart and re-assembled. The loss may be so great in a long column line that it may be necessary to insert a new piece or a larger section to obtain the desired length. The bolted type of column has an advantage in this respect, as it does not vary in length. The adjusting sleeve will take care of any variation in the length of the assembly, provided it does not exceed two inches either way.

The vertical adjustment is important, especially with an open-runner pump. If an open-runner impeller is raised too high, there will be an excessive amount of slippage, resulting in a loss of both delivery and efficiency. The adjustment of the enclosed type of impeller is not so critical as it permits a variation of perhaps three-eighths of an inch in vertical adjustment without material loss in either delivery or the efficiency of the pump.

It is not an easy matter for the water service repairman to secure the correct vertical adjustment without the use of instruments that will indicate the motor and pump performance. Probably the best method where electric drive is used is to place a watt-meter on the power line to the motor to measure the current input, and endeavor to obtain a vertical adjustment with the maximum delivery from the pump with the minimum reading on the watt-meter. If the watt-meter shows a constant load with the pump delivery at the rated capacity, this indicates that the adjustment is as near correct as it is possible to obtain. A similar procedure may be followed when other power is used; however, in such cases, the

correct load adjustment to delivery rate will depend upon the judgment of the water service repairman, as facilities are not readily available to measure the power input.

#### Air Lifts

An air lift consists essentially of an air line extending to the required depth in the well, and a discharge line to carry the water to the surface. In some installations the well casing forms the discharge line. Better results are obtained where the air line is located outside the discharge pipe, as a centrally located air line will reduce the discharge from 20 to 40 per cent.

The air lift operates on the principle that a column of air and water in the vertical discharge pipe, being lighter than the water alone, will rise in the pipe and overflow at the surface. At the surface, the water is repumped to elevated storage tanks and distribution systems.

Air is not a satisfactory medium to force water through a long horizontal pipe line, for the reason that the air, being lighter than the water, rises to the top of the pipe line and will not be effective in moving the column of water. A booster system, consisting of a closed tank, in which the air and water are separated, and the same air that has lifted the water from the well is again utilized to force the water to a higher elevation. The great majority of railway installations, however, discharge into surface reservoirs.

The principal advantage of an air lift is its dependability. It has no moving parts, and can be used in a crooked well or where there is considerable sand in the water. Its chief disadvantage is that it is low in efficiency. Pumping water from wells with compressed air is sometimes accepted as a simple matter, and positive

results are obtained even when it is handled in a haphazard manner. However, to obtain the most water at the lowest cost, certain fixed rules must be followed.

First of all, the correct ratio of submergence of the air pipe to the required lift must be maintained. Best results appear to be obtained when the submergence is 60 per cent of the lift. This is measured from the foot piece or air discharge nozzle to the discharge outlet.

Conditions frequently change in wells, particularly where they have been in operation for a long time. The water table may be lowered, which will increase the lift, or the yield of water may decrease, thus affecting both the submergence and the amount of air required, and possibly the size of the discharge pipe as well. Such changes in conditions can generally be taken care of at little expense.

The size of the discharge line must be in correct ratio to the amount of air and water handled. The velocity of the water through the discharge line should be between four and six feet per second for best results. If it is less than four feet, the air will escape through the water with a loss in efficiency, while a velocity of more than six feet will also decrease the efficiency because of friction losses. Water service repairmen should carefully adjust the air delivery to secure the most satisfactory operation both as to the amount of water delivered and the air consumed. Tests should be made from time to time to determine correct practice.

Air and discharge lines should be maintained in good condition. Excessive rust formations should be removed from the interiors of discharge lines to reduce friction, and air lines should be immediately renewed when the lines are corroded to the extent that leaks may occur.

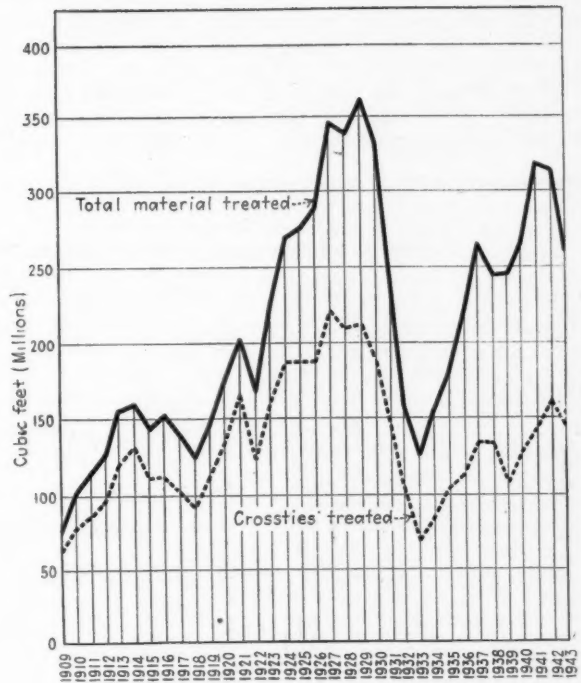
Lt.-Col. J. J. Clutz, President of the Roadmasters' Association in 1940-41 and Formerly Division Engineer on the Pennsylvania, Seated at His Command Desk in Teheran, Iran.





# War Restrictions Cause Drop in Wood Treated

War-time government restrictions and labor shortages caused a sharp reduction in the volume of wood treated in 1943 in seven of the eight classifications into which treated wood is divided. Despite this decline, however, the vital volume of wood treated has been exceeded in only four years since 1930, and in two of these by narrow margins



Graphs Show Volume of Ties and All Wood Treated in the United States Since 1908

INSTEAD of continuing the gains that have been made in wood preservation in almost every year since 1933, this trend was reversed in 1943 and sharp reductions were recorded in seven of the eight classifications into which treated wood is divided. In part, this reversal resulted from government restrictions on civilian use of forest products in the interest of more intensive prosecution of the war, and in part from an unprecedented shortage of labor in the forest areas of the country. Despite this reduction in total wood treated, however, the volume treated in 1943 has been exceeded in only four years since 1930, in two of these by only narrow margins, and only 11 times in the 35 years that this record has been compiled.

A total of 261,138,980 cu. ft. of wood was given preservative treatment in 1943, this being a decrease of 51,795,641 cu. ft., or 16.55 per cent, from the 312,934,621 cu. ft. treated in 1942, according to figures compiled by R. K. Helphenstine Jr., Forest Service, United States Department of Agriculture, in cooperation with the American Wood-Preservers' Association.

For statistical purposes, the material treated year by year is divided into eight classes. In 1943, decreases were recorded in seven of these classifications, compared with 1942, and only cross arms showed a small increase. The eight classifications include cross-ties, switch ties, piles, poles, wood blocks, construction timbers, cross

arms and materials that do not fall in any of the remaining classifications.

As in all previous years since the beginning of the wood-preserving industry, the railways maintained their position as the principal consumer of treated timber. Previous to 1939, this position had been assured by the fact that cross-ties constituted more than 50 per cent of the total volume of timber treated each year, and only the railways use ties. However, in 1939, in 1940 and again in 1941, cross-ties fell below 50 per cent of the total volume of wood treated, indicating that the consumption of products in other classifications was gaining faster than ties. Yet, even during these three years, when switch ties, piles, poles, construction timbers and other items were added, the railways consumed more than two-thirds of the total volume of wood treated. Beginning in 1942, ties again represented more than 50 per cent of the total volume of wood treated. In 1943 the ratio of ties to all wood treated rose to 55.4 per cent, while the addition of switch ties brought the combined ratio to 59.8 per cent, and the railways consumed more than the customary two-thirds of the wood treated during the year.

## Crossties Down 11 Per Cent

In 1943, 48,229,067 crossties were treated, representing a total volume of 144,687,201 cu. ft. This was a de-

crease of 5,946,313 ties, 17,838,939 cu. ft., or 11 per cent, compared with the 54,175,380 ties or 162,526,140 cu. ft. treated in 1942. As in 1942, oak ties ranked first in number with 17,285,803, or 34.8 per cent, compared with 21,892,927, or 40.4 per cent, in 1942. Southern pine remained in second place with 11,155,700 ties, or 23.1 per cent of the total, compared with 11,591,141 such ties, representing 21.4 per cent of the ties treated in 1942. Douglas fir again ranked third with 5,355,760 ties, or 11.1 per cent of the total, compared with 5,850,394 such ties treated, or 10.8 per cent of the total in 1942, and gum again stood in fourth place with 4,604,653 crossties, or 9.5 per cent, compared with 5,379,833 such ties, or 9.9 per cent for 1942.

Other woods treated for crosstie purposes included lodgepole pine, maple, tamarack, beech, ponderosa pine, birch, hemlock and elm in the order given, aggregating 8,110,350 crossties, or 16.8 per cent of the total. In addition, a few miscellaneous species accounted for 1,716,803 ties, or 3.6 per cent of the total crossties given treatment during the year.

Of the total number of crossties treated last year, 31,281,287, or 64.86 per cent, were treated with straight creosote or with solutions of creosote and coal tar; 16,411,867 ties, or 34.03 per cent, were impregnated with mixtures of creosote and petroleum; and 497,174, or 1.04 per cent, were treat-

ed with zinc chloride or cromated zinc chloride. All other preservatives accounted for only 38,739 crossties, or 0.07 per cent, of the total given preservative treatment. All ties were treated by pressure processes.

12,364,784 ft. b.m., or 8.9 per cent of the total switch ties treated in 1943. Maple, beech, tamarack, birch, elm, lodgepole pine, hemlock and a few miscellaneous species, in the order named, accounted for 14.7 per cent.

### Wood Preservation, 1909-1943 Together with Consumption of Creosote and Zinc Chloride

Year	Total material treated, cu. ft.	Number of crossties treated	Creosote used, gal.	Zinc chloride used, lb.*
1909	75,946,419	20,693,012	51,426,212	16,215,107
1910	100,074,144	26,155,677	63,266,271	16,802,532
1911	111,524,563	28,394,140	73,027,335	16,359,797
1912	125,931,056	32,394,336	83,666,490	20,751,711
1913	153,613,088	40,260,416	108,373,359	26,466,803
1914	159,582,639	43,846,987	88,764,050	27,212,259
1915	140,858,963	37,085,585	84,065,005	33,269,604
1916	150,522,982	37,469,368	96,079,844	26,746,577
1917	137,338,586	33,459,470	83,121,556	26,444,689
1918	122,612,890	30,609,209	56,834,248	31,101,111
1919	146,060,994	37,567,927	67,968,839	43,483,134
1920	173,309,505	44,987,532	70,606,419	49,717,929
1921	201,643,228	55,383,515	77,574,032	51,375,360
1922	166,620,347	41,316,474	87,736,071	29,868,639
1923	224,375,468	53,610,175	128,988,237	28,830,817
1924	268,583,235	62,632,710	158,519,810	33,208,675
1925	274,474,539	62,563,911	169,723,077	26,378,658
1926	289,322,079	62,654,538	188,274,743	24,777,020
1927	345,685,804	74,231,840	221,167,895	22,162,718
1928	335,920,379	70,114,405	222,825,927	23,524,340
1929	362,009,047	71,023,103	226,374,227	19,848,813
1930	332,318,577	63,267,107	213,904,421	13,921,894
1931	233,334,302	48,611,164	155,437,247	10,323,443
1932	157,418,589	35,045,483	105,671,264	7,669,126
1933	125,955,828	22,696,565	85,180,709	4,991,792
1934	155,105,723	28,459,587	119,049,604	3,222,721
1935	179,438,970	34,503,147	124,747,743	4,080,887
1936	222,463,994	37,952,129	154,712,999	4,127,886
1937	265,794,186	44,803,239	183,574,581	4,833,935
1938	244,221,442	44,598,678	166,183,891	4,829,590
1939	245,219,878	35,748,845	163,864,259	4,522,070
1940	265,473,149	42,666,598	174,625,305	5,180,896
1941	319,164,422	47,664,019	215,467,780	5,786,424
1942	312,934,621	54,175,380	216,347,768	5,051,263
1943	261,138,980	48,229,067	177,786,315	3,122,302

\*Includes chromated zinc chloride.

In the preparation of the ties that were treated during the year, 29,379,391, or 60.9 per cent, were adzed and bored prior to treatment, compared with 34,408,117, or 63.5 per cent, in 1942; 603,146 ties, or 1.3 per cent, were adzed but not bored, compared with 787,975, or 1.5 per cent, in the previous year; 3,112,848 were bored but not adzed, representing 6.5 per cent, compared with 3,230,529 ties, or 6 per cent in 1942; and 15,133,682, or 31.3 per cent, were neither adzed nor bored, compared with 15,748,759, or 29 per cent, in 1942.

The quantity of switch ties given preservative treatment in 1943 amounted to 138,998,919 ft. b.m., a reduction of 28,378,697 ft. b.m., or 17 per cent from the quantity treated in 1942. As in crossties, oak maintained first place as a material for switch ties, with 70,682,005 ft. b.m., or 50.85 per cent of the total; southern pine remained in second place, with 20,318,715 ft. b.m., or 14.62 per cent; Douglas fir retained third rank, with 15,255,619 ft. b.m., or 11 per cent; and gum was again in fourth place, with

Reflecting completion of a large number of army and navy port facilities, warehouses and other structures requiring the use of piles, as well as the restrictions that have been placed on civilian construction, piles reversed the upward trend that has been in evidence year by year since 1938 and fell from 42,179,210 lin. ft. in 1942,

to 30,590,022 lin. ft. in 1943. This represents a reduction of 11,589,188 lin. ft., or 27.7 per cent. As in past years, southern pine ran far ahead of other species, with 18,653,646 lin. ft. treated, or 61 per cent of the total; Douglas fir remained in second place, with 11,492,272 lin. ft., or 37.5 per cent. The remaining 1.5 per cent was made up of oak, Norway pine, gum, northern white pine, lodgepole pine and a few miscellaneous species, in the order given. All but 19,503 lin. ft. of the piles treated in 1943 were treated by pressure processes, and all but 160,595 lin. ft. were impregnated with creosote, solutions of creosote and coal tar, or with mixtures of creosote and petroleum. Other preservatives included chromated zinc chloride, Wolman salts and a few others.

In addition to the normal preservative treatments which have been given wood for many years, a considerable quantity of wood was given fire-retardant treatment, primarily as a result of accelerated demands incident to the war to make fire-resistant construction possible without the use of critical materials. The total quantity of wood treated for this purpose amounted to 65,636,518 ft. b.m., compared with 22,284,402 ft. b.m. in 1942. In these treatments 20,779,511 lb. of fire-retardant salts were consumed, consisting of 8,898,294 lb. of Protexol, 10,672,321 lb. of Minalith, 170,567 lb. of chromated zinc chloride, 5,242 lb. of zinc chloride, and 365,867 lb. of borax-boric acid, the first two being proprietary compounds. In addition, 667,220 lb. of the mixture designated as Formula 2, which is called for in the proposed federal specifications, were used in fire-retardant treatments. This compound consists of 10 per cent of diammonium phosphate, 60 per cent of ammonium sulphate, 10 per cent of sodium tetraborate (borax) and 20 per cent boric acid.

During 1943, the wood-preserving

### Number of Crossties Treated by Kind of Wood and Kind of Preservative—1943

Kind of wood	Creosote (1)	Creosote petroleum (2)	Zinc chloride	Chromated zinc chloride	Wolman salts	Zinc-metarsenite	Miscellaneous preservatives	Total	Per cent of total
Oak	14,389,986	2,890,517	—	1,900	2,400	—	1,000	17,285,803	35.84
Southern pine	9,326,342	1,809,956	11,603	—	—	—	7,799	11,155,700	23.13
Douglas fir	108,958	5,139,144	—	83,133	9,535	5,305	9,685	5,355,760	11.11
Gum	3,944,771	659,882	—	—	—	—	—	4,604,653	9.55
Lodgepole pine	—	1,265,654	346,822	—	—	—	—	1,612,476	3.34
Maple	595,548	709,025	—	—	—	—	—	1,304,573	2.71
Tamarack	280,000	944,238	—	6,000	—	—	1,200	1,231,438	2.53
Beech	541,912	423,676	—	—	—	—	—	966,788	2.00
Ponderosa pine	—	938,695	—	—	—	—	—	938,695	1.95
Birch	295,356	520,312	—	—	—	—	—	815,668	1.69
Hemlock	321,903	340,794	39,674	7,542	—	—	178	710,091	1.47
Elm	432,795	97,624	—	—	—	—	200	530,619	1.10
All other	1,043,716	672,350	—	500	—	—	237	1,716,803	3.56
Total	31,281,287	16,411,867	398,099	99,075	11,935	5,305	21,499	48,229,067	100.00
Per cent of total	64.86	34.03	0.83	0.21	0.02	0.01	0.04	100.00	

(1) Includes distillate coal-tar creosote and solutions of creosote and coal tar.

(2) Includes various-percentage mixtures of creosote and petroleum.

## Treatment of Miscellaneous Material—Ft.b.m.

	1943	1942	1941	1940
Lumber.....	270,525,549	287,191,977	281,006,886	234,133,962
Fence posts.....	21,255,494	37,401,538	28,061,805	17,926,013
Tie plugs.....	2,146,370	1,694,468	2,222,766	2,581,215
Crossing plank.....	None reported	None reported	1,360,584	724,506
Car lumber.....	159,792	272,103	220,668	None reported

industry consumed 177,786,315 gal. of creosote, compared with 216,347,768 gal. used in 1942, a decrease of 38,561,453 gal., or 13.2 per cent. It is of interest to note that, despite this large decrease, the amount of creosote consumed in 1943 has been exceeded only three times since 1930, and only eight times during the 35 years that these records have been compiled. Mixtures of creosote and petroleum consumed 28,439,733 gal. of petroleum, compared with 31,386,909 gal. in 1942, a decrease of 2,947,176 gal.

The wood-preserving industry also used 1,014,746 lb. of zinc chloride, which was 48,754 lb. less than in 1942, of which 5,242 lb. were used in fire-retardant treatments, as already noted. The consumption of chromated zinc chloride aggregated 2,107,556 lb., a decrease of 1,880,207 lb., compared with 1942. Of this amount, 170,567 lb. were also used in fire-retardant treatments.

The consumption of Wolman salts fell from 1,307,830 lb. in 1942 to 769,316 lb. in 1943, a reduction of 538,514 lb. Similarly, the use of zinc meta-arsenite declined from 239,786 lb. in 1942 to 53,516 in 1943, a decrease of 186,270 lb. There was also a reduction of 114,886 lb. in the consumption of Celcure, from 249,713 lb. in 1942 to 134,827 lb. in 1943.

In addition to the preservatives already mentioned, 20,932,510 lb. of miscellaneous salts and 23,422 gal. of miscellaneous liquids were used during the year. While this represents a gain of 15,339,426 lb., or more than 274 per cent, for the salts, 20,603,702 lb. were used in fire-retardant treatments, leaving only 328,808 lb. used for preservative treatments, which compares with the 804,314 lb. that were used for this purpose in 1942, a reduction of 475,506 lb. The consumption of liquid preservatives in 1943 represents a decrease of 171,167 gal. from the 194,589 gal. that were used in 1942.

The number of treating plants in 1943 was 234, or 2 less than in the previous year. Of these, 229 were in active operation, 4 were idle and 1 was abandoned. No new plants were constructed during the year. One of the idle plants was of the pressure type and three were of the non-pressure (open tank) type. Of the total number of plants in existence during the

year, 188 were commercial plants that treat wood by contract or for sale; 22 were owned and operated by railways; and 24 were owned by public utilities, mines and others, to supply their own needs for treated wood.

## Tributes to Mr. Howson

(Continued from page 906)

with them. He rendered them an invaluable service and we shall miss him very much."—*H. E. Woolery, Pres., Woolery Machine Co.*

"I know that Mr. Howson has been a tower of strength in your organization. Mr. Cassil, our chief engineer, has done considerable work with him and has spoken to me of his ability and helpful assistance to the A.R.E.A. in its many endeavors."—*Robert J. Bowman, President, Pere Marquette.*

"Accept my condolence in your loss of Elmer Howson. He was friend and associate of mine, especially in connection with the affairs of the Railroad Superintendents' Association. His untiring efforts are responsible for a great part of its success, especially in recent years. We are shocked and grieved to hear of his passing."—*O. C. Lott, Superintendent Transportation, Baltimore & Ohio.*

"We were shocked to learn of Mr. Howson's sudden passing. He has been one of the outstanding railway men in the country and has always taken such an active part in so many railway associations that his loss will be very keenly felt."—*Burt Anderson, Transportation Research Director, Union Switch & Signal Co.*

"I learned today of the death of my good friend Elmer T. Howson. In his passing the Simmons-Boardman Publishing Corporation has lost a loyal and faithful member; the railroad transportation industry a great student and counselor; and the various associations a true friend and leader. His passing will be felt in many places."—*L. M. Dennev, retired supvr., New York Central Lines.*

"My feeling is one of great personal loss. Through acquaintanceship of 14 years I had come to understand

and to respect and admire Mr. Howson's ability. I believed him to be incomparable in the railroad world, and I am sure his passing will leave a void in many places."—*H. E. Kirby, Asst. Engr., Chesapeake & Ohio.*

"I always had a high regard for Mr. Howson, having been on several A. R. E. A. committees with him, as well as other groups. Always sincere, never afraid to express his ideas or opinions, yet courteous and considerate of others. The Simmons-Boardman Publishing Corporation has lost a good and faithful employee."—*W. A. Murray, Engr. M. of W. (retired), New York Central.*

Perhaps the most fitting, sincere and understanding tribute to Mr. Howson was that paid him by the man who sought him out and employed him 33 years ago, and who had been his immediate superior ever since, Samuel O. Dunn, Editor of the Railway Age, and Chairman of the Board of the Simmons-Boardman Publishing Corporation, publishers of *Railway Engineering and Maintenance*, who wrote in the September 9 issue of the Railway Age, in part as follows:

"I would fail in my duty to Mr. Howson, his family, the railroad and railroad supply industries, his other business associates and myself if I did not pay my tribute to him—a tribute which, perhaps, nobody knows so well as I, must be inadequate. \*

"Mr. Howson was only 27 years old when I employed him as *Engineering and Maintenance* Editor of the Railway Age; and he was for 33 years one of the ablest and most constructive, and unquestionably the hardest working member of the organization of what is now the Simmons-Boardman Publishing Corporation. Probably his most outstanding characteristics were loyalty to all who had any claim on him, the inflexible convictions of a profoundly religious nature, enormous capacity for work which enabled him to carry on simultaneously almost innumerable activities, and excellent judgment.

"There seemed no limit to the number of things he wanted to do, could do and actually did, and did well. His passing is a heavy loss to the company that he served so long with an almost fanatical devotion, boundless energy and great ability. It is also a real loss to the entire railroad industry and to its affiliated railway equipment and supply manufacturing industry. He will live long in the grateful memory of his associates in business and of friends in the railway field who can be found in almost every community in the United States and Canada, and even in Mexico."





# What's the ANSWER?

## Inspection of Switches

*In view of the volume and importance of today's traffic, what changes, if any, should be made in the inspection of switches? By whom should they be inspected? How often? What details should be examined? What action should be taken?*

### Has Made No Change

By F. G. CAMPBELL

Assistant Chief Engineer, Elgin, Joliet & Eastern, Joliet, Ill.

Although the volume of traffic has increased with us as it has on other roads, we have not found it necessary to make any changes in our system of switch inspection. These inspections are now made with the same personnel as in normal times, that is, outside of our large terminals and industrial yards, the switches are inspected by the track foreman during his regular patrol tours. In our large terminal and industrial yards, these inspections are made by track walkers and foremen. In these areas, we have track walkers and, in some cases assistant foremen, on duty 24 hours a day. However, this was our practice prior to the present heavy increase in traffic, and we have not found it necessary to increase the inspection personnel because of the increased volume of traffic.

It is somewhat difficult to say how often switches should be inspected, since this will depend largely on their location and the frequency of their use. I believe, however, that in general, all switches subject to heavy traffic, should be inspected at least once a day.

The details to be examined are no different from what they have always been. There are no changes in the type of wear because of increased traffic, although the greater volume of traffic does intensify this wear. Items which are of greatest importance include the switch points them-

selves; conditions at the joint at the heel of the point, such as loose or broken bolts; loose and broken bolts at the frog; and the extent of wear, especially at the point and throat of the frog.

Repairs should be made as quickly as practical; if minor, they should be made immediately by the track walker. In the case of manganese-steel frogs or inserts, indications of possible future failure should be reported to the foreman or supervisor for continued and close observation.

### No Accident Unimportant

By A. B. CHANEY

District Engineer, Missouri Pacific, Little Rock, Ark.

No accident is unimportant, and the minimum requirement for main-track switch inspection should be such as to insure maximum safety in operation, within practical applications. Thorough inspection of main-track switches once a month by roadmasters or track supervisors and weekly by track foremen, is sufficient under both past and present conditions. Signalmen, foremen and others who pass over or work around turnouts and switches, should keep a close watch for defects. Where conditions require track walk-

### To Be Answered in December

1. What means can be employed to keep track labor, including Mexican Nationals, employed productively during the winter months?

2. In what ways are fire extinguishers misused? How can this be overcome?

3. What practical use, if any, can be made of tie-tamping equipment during the winter? Does this differ for the several forms of power employed?

4. To minimize delays to trains, what procedure should be followed in renewing a ballast-deck trestle? In changing from an open to a ballast deck?

5. Should seats on a track motor car be assigned to members of the gang? What duties should be assigned to each man? Why?

6. Where trouble is experienced with ice in tanks, what can be done to prevent float and altitude valves from becoming inoperative during periods of low temperature?

7. What measures can be taken to insure adequate drainage at railway crossings? Where natural drainage is lacking?

8. Where steam or hot water is available at a central power plant, how far is it practicable or economical to pipe it for heating purposes? What considerations are involved?

ers, the inspection of switches is one of their most important duties.

The time interval between inspections, as well as the necessity for making inspections of switches, like the inspections of bridges, depend more upon the age of the structure and the condition of the material than upon the density of traffic. Every six months, all main-track switch stands, switch and connecting rods, clips and bolts, should be removed,

Send your answers to any of the questions to the What's the Answer Editor. He will welcome also any questions you wish to have discussed.

cleaned thoroughly, and inspected carefully for corrosion, cracks and other defects. At this time worn, weak and defective parts should be replaced, and all parts to be returned to service should be oiled before re-assembly.

If an unsafe condition that cannot be corrected immediately is disclosed by any inspection, adequate safeguards, such as spiking the points, placing speed restrictions over the turnout or stopping traffic, as circumstances may require, should be thrown around the turnout until repairs can be made. At present when so many of our trackmen are without experience or have only limited experience, special effort should be made to assign experienced men to the inspection of switches, or to provide those of less experience with special instructions to insure that they will know what to look for, and what to do if they discover defects.

### Leave Nothing Out

By W. H. SPARKS

General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

Regardless of the volume of traffic or speed of trains, nothing should be left out or overlooked when making a switch inspection. So far as I can

see, however, no changes in the methods of making the inspections are called for by the larger-than-normal volume of traffic that we are now handling, although I believe that they should be somewhat more intensive than has heretofore been customary, for the safety of every train passing over the road depends on the ability of the numerous main-line switches to function correctly at all times.

Switch inspections cannot be made too often or too carefully. Parts of cars or materials from lading may drop from trains and lodge in turnouts where they would create a serious hazard. Parts of the switch assembly become worn with continued use or may be damaged and thus create an equally serious hazard. Again, at present we are faced frequently with the necessity for using reclaimed materials. All of these conditions require that turnouts be given frequent and careful attention. Every part of the turnout, including the points, the frog, the gage of the leads, the condition of all bolts, the conditions of and at the joints, the amount of throw, the condition of the ties, especially those under the switch stand, the spiking and the stand, should be thoroughly examined. Switch stands, although they are important elements of switch assemblies, are often abused severely and, therefore, these also require careful observation.

of the next season. These inside jobs will usually involve the interiors of smaller or division office buildings, shops, including stores and oil houses, and miscellaneous buildings.

When contracting painting work, care should be exercised to insure that there are no painters on the division with seniority, who are not working. Obviously, if all of the company painting force is employed and there are no other workmen who might establish a claim for re-employment in the event that work is contracted, then there can be no reason why all of the extra painting that needs to be done, may not be contracted to catch up on deferred maintenance.

Sometimes it is quite advantageous to contract such work locally, as there are few places that do not have at least a few expert painters, and the work can be completed for less money than if done by the railway's own forces. Furthermore, it creates a better feeling in the town, resulting in more business for the railway, especially if more than one line serves the community.

Contract work can be done advantageously on large multi-story buildings which require extension staging for both exterior work and high ceilings; where better appearance is desired, especially on interior walls, ceilings and trim; and where special decorative effects are desired, such as cannot be done ordinarily by bridge painters.

## When Painters Are Scarce

*Where is it difficult to obtain experienced painters, are there any advantages in allowing contractors to do the work? Any disadvantages? For what classes of buildings? What other considerations are involved?*

### Frequently Desirable

By A. T. HAWK

Engineer Architect, Chicago, Rock Island & Pacific, Chicago

Frequently, it is desirable to contract the painting of our larger and better buildings, including important depots, especially if they are owned jointly, and office buildings and other structures used by the public. Usually, a better grade of painting will be done by a contractor who makes painting and decorating his principal business, than we can do with our own forces, for in a division organization there are usually only a few good house painters and not enough skilled workmen to turn out a real piece of work of any size within a reasonable time.

Usually, most of the division paint-

ers are employed steadily in the field, painting bridges, which important work is carried on through all of the months of the year during which this class of work can be done.

To hold good painters, work should be so planned as to provide inside jobs for these men during inclement weather when outside painting is not feasible. Again, a small gang of painters should be assigned to follow up the carpenters who are engaged in programmed work on both main and branch lines, taking in all of the structures needing maintenance work, painting and cleaning up one building at a time before going to the next, completing the work progressively.

The best men in the paint gang must be provided with inside work during the winter months to insure that they will remain with the company and be available at the beginning

### No Set Rules

By G. S. CRITES

Division Engineer, Baltimore & Ohio, Baltimore, Md.

Conditions surrounding painting are so many and varied that no set of rules can differentiate between when it is good practice to contract the work, to let it go until experienced painters are available, or to put on inexperienced men to protect the deteriorating surfaces. Obviously, the latter course cannot be followed for important station and office buildings, because a satisfactory job cannot be done by inexperienced painters on, and more particularly in, such buildings. If they need painting, a responsible house-painting contractor should do the work. He will be fully equipped to protect desks and appurtenances, and occupants or patrons, from wet or dripping paint. Furthermore, a good job is practically assured if competent inspection is provided.

Many roadway and other service buildings can be painted by spraying, and it has been found that many young or inexperienced operators can

soon learn to do a reasonably good job of painting on such buildings. Therefore, there should be few places where enough labor will not be available for such painting. This applies also to small steel bridges, where complete staging or scaffolding is not needed. Usually, on such bridges, the scraping and other cleaning required involves the most labor, and experienced painters are not needed for such work.

Large and important bridges cannot be painted satisfactorily by inexperienced labor, so that, if such structures need painting, the work should be given to a painting contractor who has a good reputation for such work. Even then, however, an experienced and dependable inspector should be assigned to the work to insure that all surfaces are cleaned carefully and then covered as they should be with paint.

### Generally Small Advantage

By GENERAL INSPECTOR OF BUILDINGS

Painters working on station and roadway buildings, or on many other types of buildings over a long period of time, become efficient in that particular type of work, so that like workers in assembly lines, their tasks become routine and they accomplish more than artisans who are continually changing from one type of building to another.

A railway paint gang may be able to do an excellent job of painting the usual type of station building in the shortest possible time, yet it might do quite an unsatisfactory job, and at excessive cost, when it comes to removing varnish or cleaning and re-finishing a rubbed varnish finish. Again, such a gang might find it difficult to paint a high steel bridge or to do an unusual type of work where special equipment is required.

Strict precautions against fire and explosion must be observed, particularly when working around grain elevators, and such work should always be done by men who are familiar with those hazards. Likewise, there are safety rules to be observed continually in the operation of a railway, and men working any place on the right of way should be familiar with these rules and requirements and the hazards upon which they are based.

It seems that there is little advantage in contracting the usual routine work, unless painters are not available for railway employment, since the road gangs are, or should be, sufficiently skilled and adequately equipped to do the work to better advantage

than a contractor can be expected to do it. However, it is equally obvious that buildings of special design or construction, having unusual finishes and requiring expensive equipment to paint, can be handled to better ad-

vantage by an experienced contractor than by company forces. In general, work of this character requires expert supervision, which can be assured if the contractor or his superintendent gives it his personal attention.

## What Speed for Weed Burners?

*What is the most advantageous speed for the operation of a weed burner? Why? What are the effects of operating at higher or lower speeds?*

### Searing Gives Best Results

By L. G. BYRD

Supervisor of Bridges and Buildings,  
Missouri Pacific, Poplar Bluff, Mo.

There are several designs of weed burners placed on the market by various manufacturers, all of which are satisfactory in performance. The burning speed will vary with the type, the size and the number of burners; with the character and density of the weeds; and the time of burning. The most practical, economical and effective operation of a weed burner requires that it travels at a rate of speed as high as is compatible with the purpose of the equipment, which is to kill the weeds. This is the speed that will sear the foliage without burning it, that is, without consuming it.

If a five-burner machine is employed, and the burners are so spaced as to throw a solid and continuous sheet of flame clear across the track, the speed over a light growth of vegetation can be increased to from eight to twelve miles an hour, when it is following two or three days behind a track mounted mowing machine. If the vegetation is heavy, such as a good stand of Johnson grass, it may be necessary to reduce the speed to three to six miles an hour. Under all conditions, however, the speed should not be greater than that at which the section forces can follow up and put out fires on ties and prevent the fire extending beyond the lines of the road-bed.

These statements are predicated on the assumption that the weed burner is to be operated before the weeds

have attained maturity and have gone to seed. If the plants have ripened and are beginning to dry, a speed that will insure complete combustion of the above-the-ground portions of the plants will probably be entirely satisfactory. On the other hand, if the plants are still vigorous and growing, a speed that will apply the flame so lightly that the plants will not wilt for about 24 hours, will give better ultimate results than any other speed. If the flame is applied in this manner, the roots, as well as the top of the plant, are killed, according to information given by the Bureau of Reclamation, United States Department of Commerce.

### Depends on Kind of Weeds

By C. R. KNOWLES

Superintendent Water Service (Retired)  
Illinois Central, Chicago

There is considerable difference of opinion concerning the most advantageous speed when burning weeds. As a rule, the speed of operation is left to the judgment of the operator. Commonly accepted speeds are from four or six miles an hour. This is influenced, however, by the performance of the earlier types of burners, in which the flame temperatures were much lower than those obtained in the more modern designs. Another reason for these restricted speeds is that there is a somewhat common belief that the weeds should be consumed as completely as possible. This generally requires a second burning immediately after the weeds have wilted down and are partially dried.

An important factor in considering the speed at which the burning should be done is the time at which the weeds are burned. If they are burned just before the budding stage, when the food reserves in the roots will be at the lowest, merely searing the plants will usually be effective, and this can be done at a speed of about eight miles an hour. If the foliage and





stems are merely seared, without being burned, the root system is affected to such an extent that the plant will die. It has been shown by tests that plants can be killed in this way, whereas they will sprout up from the roots in a short time if the plant is burned completely.

The searing causes the weeds to wilt down to the root system and die. This result was obtained when a weed burner was operated at eight miles an hour, and a test showed that this speed was more effective than lower speeds and heavy burning that destroyed the tops but did not affect the root system. However, for maximum effectiveness the burning must be done at the right time, which is immediately prior to the budding stage. Again, the speed of operation will be influenced by the character and density of the weeds. Slower speeds may be necessary where the growth is very dense, to insure that the flame will reach all of the foliage.

The experiments that have been mentioned were conducted on a west-

ern railway to determine the most effective operating speeds for the weeds in the locality where the test took place. These consisted of white top, clover, Russian knap weed, and others common to the Northwest. They were conducted at speeds of four, six, eight and ten miles an hour. The results indicated that for the weeds mentioned, a speed of seven to eight miles an hour was more effective than speeds of four to six miles an hour for the species mentioned. While this speed may not apply in all cases with other species, the test indicates the possibilities of faster burning if done at the right time.

The advantages of operating weed burners at speeds higher than those heretofore in vogue include the greater mileage that can be covered in a given time, less cost per mile burned, a marked decrease in the fire hazard, and material savings in the volume of oil required. At present, the latter is probably the most important factor of all.

out so that they will not cause snow drifts to form. Snow fences should be in good repair. All important switches should be provided with snow brooms to facilitate the cleaning of switches. Ballast should be dug from between the ties under the switch points and stock rails to help as much as possible in keeping them clear of snow.

All switch points, stock rails and frogs that are in need of renewal should be changed out before winter sets in, to avoid as much as possible replacements during the winter. Along with this, a thorough canvass of the yard should be made before freezing, to clean up all scrap and surplus material that might cause injury to train or enginemen when alighting from cars and locomotives. A supply of sand should be provided for sanding slippery leads, turntables, and walks to reduce accidents from slipping. Snowplow equipment should be in good order, with an ample supply of shovels and brooms.

Snow scrapers should also be provided, the size to depend on the method of haulage, that is whether by tractors or horses. Such scrapers are invaluable for cleaning yard leads and industry tracks, and station platforms and public crossings, where snow cannot be moved with the ordinary track plow. Power tools for picking ice should also be available.

Having suitable equipment and man-power available and in readiness to handle snow storms is essential to keeping traffic moving. In the larger yards, switch heaters can be used to advantage, since they reduce the requirements for both man-power and equipment, and give excellent results in the way of cleaning the switches of snow.

## Getting Ready for Winter

*What preparations should a yard gang make for winter?*

### Get in Tip Top Shape

By W. H. SPARKS

General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

Even in normal times there is no more important work than that of preparing yards for the winter season of heavy business and hampering snow storms. Today this importance has increased many fold because of the extraordinary volume of traffic that is passing through our yards, much of a military nature, for adequate preparation will eliminate many delays to traffic that are likely to occur if such preparation is not made.

Tracks should be tied and put to good surface, gage and line, well in advance of winter so that this will not be a last-minute job when other things are calling for attention. Likewise, ladders, crossovers and other switches should be in the best possible condition, with the ballast cleaned out from around switch and connecting rods and frogs, to insure their continued functioning. In other words, all tracks and trackwork should be in tip top shape when winter comes.

Drainage channels should be opened for quick disposal of water,

whether from rain or melting snow. A special clean-up of scrap, material lost from cars, and all forms of debris should be made well ahead of the first snow storm. Coal obtained in this manner should be loaded for use on yard switching locomotives.

It is doubly important that an ample stock of tools and supplies be on hand, for it is seldom practicable to replace exhausted supplies while the storm is at its height. In addition, a suitable organization is essential. Every man should know where he is to go and what he is to do when the storm strikes. Confusion will result otherwise.

### Drainage Must Be Good

By C. HALVERSON

Division Roadmaster, Great Northern, Willmar, Minn.

When preparing for winter, yard foremen should know that their tracks are so dressed as to permit surface water to disperse quickly. Culverts and other drainage openings should be cleaned out and vegetation should be cleared from surface ditches. All weeds that are higher than the rail should be cut

### Ample Supplies Needed

By E. E. CROWLEY

Roadmaster, Delaware & Hudson, Albany, N. Y.

Preparation for winter in yards is most important. Switches should be cleaned and drained adequately. Switch heaters should be inspected, and if repairs are necessary, they should be made. Tracks should be cleaned and all miscellaneous scrap should be picked up and disposed of. Coal that has been spilled in the vicinity of coal chutes and engine-houses should be cleaned up and loaded for use. Switches and tracks should be checked for gage, so that none of this class of work will be necessary after snow arrives.

Snow shovels, brooms, salt, snow-melting oil, and kerosene should be on hand by the first of November. A supply of sand and cinders, mixed with calcium chloride, should be placed at stations for sanding icy spots on platforms where passengers must walk, and along ladder

tracks where switchmen and trainmen must pass. Foremen should have an understanding with their men as to where they must report in case of severe storms. It is advisable never to send inexperienced men out alone to clean switches. An experienced man should be in each group.

## Churning on Bridges

*Is there a greater-than-normal tendency for the ballast on ballast-deck bridges to churn under present heavy traffic? Why? How can it be overcome?*

### Evidence of Dirty Ballast

By GEORGE STAFFORD  
Section Foreman, Canadian National,  
Redland, Alta.

An acute shortage of man-power, at a time when a greatly increased volume of traffic and high train speeds demand a higher standard of maintenance, is responsible primarily for the present greater-than-normal tendency for the ballast on ballast-deck bridges to churn, which every elert trackman has observed. The presence of churning ties on a bridge, as it is on the normal roadbed, is definite evidence of dirty ballast, aggravated by defective drainage.

If the condition has been allowed to progress to the chronic stage, examination will reveal that the ties have vertical movements under the passing wheels, and that this movement takes place in sealed pockets in the ballast, so that the action of a tie resembles that of a piston in a cylinder. Obviously, the only effective method of overcoming the condition, once it is established, or of preventing it when the first indications are observed, is a general cleaning of the ballast, for clean ballast does not churn. If the ballast is easily abraded or is disintegrated by the elements, it should be replaced with clean ballast that is more resistant to these forms of destruction, or the same situation will recur.

Hard materials, such as furnace slag, trap rock and durable limestone, are preferred for ballast decks. Washed gravel having hard pebbles is a suitable material for timber decks but exhibits a tendency to roll and become mobile on steel and iron-plate decks. Angles, cleats or troughs are provided to eliminate this action. It is essential that ballast decks be so designed that they will allow free drainage. A great number of the early designs were defective in this particular.

Track foremen can assist materially

in preventing this trouble by maintaining good alinement and good surface across structures. Constant working and loosening of the ballast will prevent the formation of the sealed pockets and will sift such cementing material as the ballast contains to the bottom of the deck.

### Worse on Older Bridges

By M. A. BERINGER  
Bridge Inspector, Illinois Central, Chicago

It is my observation that, where foul or dirty ballast does not provide adequate drainage, there is a greater-than-normal tendency for the ballast on ballast-deck bridges to churn as a

result of the present abnormally heavy traffic. Some small spots where there is churning result from creeping rail, which pushes improperly spiked ties off the hardened bed. The worst condition of churning is found, however, where excessive fouling of the crushed stone or slag ballast has taken place. The only way to overcome this condition is to remove the fouled ballast and replace it with clean ballast. This is only a temporary and not a permanent cure, however, for the new ballast will eventually become fouled and the original condition will be repeated.

After the old ballast has been removed and before the clean ballast has been placed, all drainage openings should be cleaned to insure that they will function correctly, and all weep holes should be opened and kept open. Where only one or two ties on a bridge are churning, the trouble can be corrected sometimes by tamping the swinging ties and then loosening the surrounding ballast to provide for drainage.

More churning is occurring at present because more, heavier and faster trains are being operated today than ever before, with the result that the ballast is fouling faster than under normal conditions. Adding to this, the present acute shortage of man-power makes it utterly impossible for the track forces of the railroads to give these bridges the attention that they should have.

## Power Tools for Sections

*What power equipment or tools other than spot tampers can section gangs use to advantage to overcome the present deficiency in labor? Is it practicable to assign them permanently? Why?*

### Only a Few Suitable

By DIVISION ENGINEER

While a comparatively large number of power machines and tools can be used to advantage in section work, and are of high value during this period of acute labor shortage, only relatively few of them are adapted for permanent assignment to sections. In some cases the reason for this is obvious; in others it is not quite so clear. What types of machines are adapted for section use? These include unit tampers, power mowers for use at large stations and in yards, power drills for use in yards and, in some cases, power saws. Other tools that can be passed from section to section are bolt tighteners, rail saws, power grinders, tie cutters and others

that cannot be used sufficiently long to make it economical to assign to sections permanently.

These power machines and tools can be assigned to a supervisor's district and scheduled by him from section to section, so that every section on his district will benefit from their use, and at the same time the machines will be kept in service a sufficient time to justify their purchase.

Other machines such as power jacks, weed burners, discers, joint oilers, power ballasters and other large machines should be scheduled on a division or regional basis, since they cannot be used to advantage by the individual sections, except for a comparatively short time in any season.

Another thing to keep in mind is that the larger machines require trained operators, and that sections

normally do not have enough work for such machines to keep either them or their operators busy more than a small part of the time. It follows, therefore, that only those machines that do not require trained operators are suitable for permanent assignment to sections, and then only when the amount of work that is to be done is sufficient to keep the machine or tool busy most of the season.

### Must Have Enough Work

By H. F. FIFIELD

Engineer Maintenance of Way, Boston & Maine, Boston, Mass.

Power tampers, power grinders, bolt tighteners, discers, joint oilers, tie cutters, weed burners, power drills, power jacks, power rail saws, power ballasters, power spike pullers, power adzers and other similar equipment are all helpful to save man-hours for section crews, provided they have sufficient work to enable them to keep the

machine or machines busy and thus warrant their being furnished. We do not assign permanently any of these machines, except spot tampers and power drills, and the latter only to large yard gangs.

All other power tools are assigned to division engineers or to the supervisor of work equipment, who, upon request from the track supervisor, furnishes the machine, with operator when necessary. We do not believe that the average section will have sufficient work to keep these power machines employed steadily or to warrant section assignment.

To warrant their purchase, all of these machines must be used a large percentage of the time, and if they are assigned to various sections as their work requires, they can be used a sufficient amount of time to justify their purchase. Scheduling the machines progressively over divisions, where the amount of work is sufficient to keep them busy for a period long enough to warrant the assignment, will pay attractive dividends.

## Cast Iron for Suction Lines

*In view of the difficulty in obtaining wrought-iron and steel pipe, is it feasible to use cast-iron pipe for suction lines? What are the advantages? The disadvantages?*

### May Take More Maintenance

By J. H. DAVIDSON

Water Engineer, Missouri-Kansas-Texas, Parsons, Kan.

Genuine wrought-iron pipe with screwed joints is considered the best material for suction lines, for the very important reason that the suction line must be free from air leaks, and there is less danger of leaks in wrought-iron pipe with screwed joints, than with other types of joints. This is true particularly where the pipe is so located that it is apt to settle after construction, or is subject to vibration. However, if wrought-iron pipe is not available, cast-iron pipe may be used. In fact, the cast iron will usually be less affected by corrosion than the wrought iron, and will not require replacement as soon. On the other hand, quite a lot more maintenance labor is required on a cast-iron suction line, in keeping air leaks repaired.

If a little extra care is taken when laying cast-iron pipe, however, to avoid subsequent settlement, and later to prevent subjecting it to severe vibrations, it should give satisfactory service in suction lines. There are

many types of mechanical joints for cast-iron pipe, some of which might be used advantageously in some locations. The regular lead joints in bell and spigot cast-iron pipe can be reinforced with clamps to help protect them against movements that might develop air leaks and thus call for considerable repair work.

### Cast Iron Has Longer Life

By E. C. JOHNSTON

Water Service Foreman, Baltimore & Ohio, Punxsutawney, Pa.

Cast iron has been and can be used for the main part of either long or short suction lines of reasonably large diameter. It is not good practice to run the cast-iron line too close to the pump, as the pump vibrations can better be taken up in a short length of welded wrought-iron or steel pipe with good results. There are suitable compromise fittings available for connecting the wrought-iron and cast-iron sections of the suction line. If, however, such connections are not available, home-made welded joints can be improvised.

If cast iron is used for lines of

small diameter, it will be best to use ground ball-and-socket joints, held by bolts or clamps. These joints allow a considerable amount of flexibility and make smoother surfaces at the joints than the bell-and-spigot design, thereby reducing friction. For the larger sizes, leaded bell-and-spigot joints are best. Clamps should be used at the joints of large-diameter pipes, where the line may be disturbed by loading.

Wrought-iron and steel pipe generally have smoother inner surfaces than cast-iron pipe, but for the larger sizes this difference is negligible. Cast-iron pipe does not stand heavy water hammer very well, and where this is likely to occur, precautions should be taken to avoid damage. A swing check valve may be needed at the intake and an air-cushioned column may be needed on the body of the line.

Cast iron has a much longer life in corrosive soils than either steel or wrought iron, but cast-iron pipe is more difficult to install, repair and renew than either wrought iron or steel. Methods for casting iron pipe have been improved recently, and pipe of lighter weight for equal sizes can now be obtained, which has proved to be satisfactory for suction lines. Long-radius fittings are also available, which are easy to install and which tend to reduce friction in the line.

### Is Entirely Feasible

By C. R. KNOWLES

Superintendent Water Service (Retired), Illinois Central, Chicago

It is entirely feasible to use cast-iron pipe in suction lines, provided suitable care is exercised in the construction of the lines. A certain prejudice against the use of cast-iron pipe for this purpose has existed for many years, the objection to its use being based largely upon the type of joint employed, rather than on the pipe itself. The theory advanced was that the leaded joint was subject to leakage because of vibration from the pump. However, there is little probability of vibration sufficient to affect the integrity of the suction line where a centrifugal pump is employed, although the avoidance of air leaks is of much more importance than where the pump is of the reciprocating type and should be watched for carefully.

Special care should be exercised in making bell and spigot joints in suction lines. The preparation of the joint requires the selection of suitable jointing material, and the joint should be made by a skilled



water-service man. Lead should always be used for the joint as cement or other materials are not likely to prove satisfactory because they cannot be calked tight. The jute or yarn should be placed firmly and evenly to the correct depth. The surfaces should be dry, and the joint should be made with a single pouring of the lead, which should be at the correct temperature, this being of more importance than is sometimes recognized. The pipe should be blocked carefully so that it will not be disturbed after the joint is finished.

Many different types of jointing materials are now available, some of which overcome the objections to the conventional poured joint. They have all of the advantages of the screwed or flanged joint and, in addition, some of them permit a certain amount of flexibility. With these improvements in the methods of making joints, cast-iron pipe is not only satisfactory for suction lines, but in many cases is even more desirable than other materials, because of its greater resistance to corrosion. Generally, cast-iron suction lines are less expensive than those of wrought

iron or steel and, if the joints are made correctly, maintenance is likely to be less.

Cast-iron pipe may be less desirable for long exposed suction lines where it is necessary to protect it against freezing, or where the weight of the pipe is a matter of importance. On the other hand, the design of the line and the manner in which it is laid and in which the joints are made are of equal importance with the kind of pipe used. A suction line should be as short and direct as practicable, with as few joints and bends as possible.

Regardless of the kind of pipe used, the joints should be bottle-tight and the pipe should be laid to a uniform grade, with a fall from the pump. Precautions should be taken to avoid any settlement or misalignment. This is of particular importance where centrifugal pumps are in service. Most of the trouble experienced in the operation of pumps originates in the suction line or the suction end of the pump. For this reason, a well-designed and well-constructed suction line is essential to the dependable operation of the pump.

be applied about ten days later. After the second coat of red lead has dried sufficiently, a finishing coat of any desired color can be applied to suit the conditions and the site. We have used aluminum paint for the finish coat and have obtained satisfactory results from its application.

Corrugated metal roofing and siding are usually applied to sheathing that is placed on two to three-foot centers. This leaves large areas of metal surfaces exposed on the interior of the building. In many cases these surfaces are attacked as actively by corrosive gases and deterioration begins earlier and progresses more rapidly than it does on the exterior surfaces. This can be prevented, however, by cleaning and painting the areas between the sheathing in the same manner as the process suggested for the exterior surfaces.

Under no conditions should rust spots be allowed to remain on any surface of metal roofing or siding for any extended period. The cleaning and painting should be done promptly as soon as the rust spots appear.

Since it is now practically impossible to obtain corrugated roofing or siding for replacements, it becomes imperative that we protect what we have in service to the best of our ability. Obviously, there is a limit to the service life of any metal roofing and siding, but that is no excuse for allowing this material to deteriorate more rapidly by reason of failure to keep the surfaces clean and well painted.

## Corrugated Roofing and Siding

*In view of the practical impossibility at this time of obtaining material for replacements, what special precautions should be taken in the maintenance of corrugated roofing and siding?*

### Do Not Allow to Rust

By L. G. BYRD

Supervisor of Bridges and Buildings,  
Missouri Pacific, Poplar Bluff, Mo.

Corrugated metal roofing and siding made from 20, 22 or 24-gage sheets will give service for approximately the life of the frame structure to which they are attached, provided it has been well galvanized, depending chiefly on the life of its fastenings and the care that is given to its maintenance. If the fastenings are suitable and both they and the sheets are protected against the attack of gases by the use of paint, there is no reason why this form of covering should not last for 40 to 50 years.

Corrugated roofing, or any other metal roofing for that matter, should not be allowed to become rusty, but at the first sign of corrosion should be cleaned and given a protective coat of a suitable paint as soon as possible. In general, under almost all conditions, good galvanized

roofing requires practically no attention for the first four or five years after application, provided the galvanizing coat has not been broken or otherwise damaged, and the material has not been exposed to active deteriorating gases. Eventually, however, spots of corrosion will appear. They should be cleaned thoroughly with wire brushes and dusters as soon as they are discovered, and this cleaning should be followed up at once with an application of two coats of red lead in linseed oil.

Scrapers should never be used for cleaning galvanized surfaces, or even uncoated metal surfaces, for such tools often dig into the metal, peeling off sound coating from other areas, or gouge into the base metal, thus hastening failure. If the roofing or siding has been allowed to become covered completely by rust, it is better to use the sand blast for cleaning it, following this immediately with dusters and the application of a primer coat of red lead. A second coat of red lead in linseed oil should

### Keep Well Painted

By G. A. RODMAN

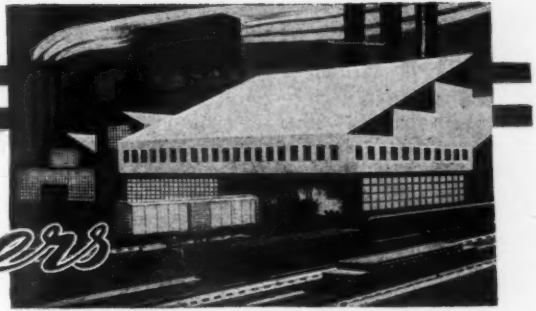
General Supervisor of Bridges and Buildings, New York, New Haven & Hartford, New Haven, Conn.

Galvanized-metal sheets should be painted as soon as they show signs of corrosion. If they have been allowed to become badly rusted, all rust areas should be cleaned with a wire brush. The surface should then be spot-coated with a metal primer and then given one full coat of paint.

If one of the better grades of sheets that are coated with asbestos and asphalt is used, very little maintenance will be required. If such sheets show signs of failure after long service, a heavy coat of asphalt dressing will provide protection for a number of years. The same treatment will apply equally as well to similar sheets of zinc, aluminum or asbestos corrugated roofing or siding.

# PRODUCTS

## of Manufacturers



### Andover Power Unit

THE Andover Motors Corporation, Elmira, N.Y., has developed a lightweight and compact auxiliary power unit, consisting of a gasoline engine and generator, designed specifically along aircraft engine lines, where high output, minimum weight and maximum reliability are the predominating features. Such power units can be utilized in many types of railroad maintenance work to power electric tools, such as tie tampers, riveting hammers, rivet cutters, drills, wood borers, circular and chain saws, chipping hammers, rotary steel brushes, power wrenches, tie adzers, bolt tighteners, rail and bonding drills, grinders,

throw, one-piece counterbalanced crankshaft supported in two plain bearings; a gear-driven oil pump with a built-in filter; magneto ignition; and a diaphragm-type fuel pump. The unit is only 30 in. long, 20½ in. wide and 16½ in. high.

### New Welding Goggle

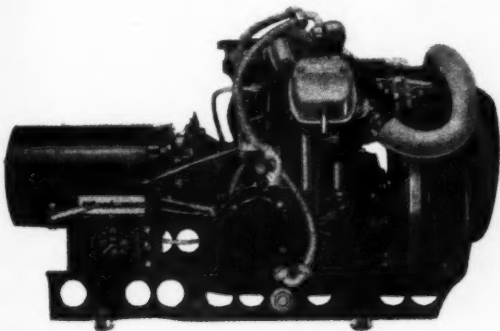
DESIGNED to afford maximum protection to welders, a new AO Dura-weld welding goggle has been produced by the American Optical Company, Southbridge, Mass. Principal features of the glasses include (1) newly designed eyecups anatomically molded for the right and left eye and

lenses in No. 3, 4, 5, 6, or 8 shades. Optional equipment includes Filter-weld lenses in No. 3, 4, 5, 6, 7, or 8 shades; Noviweld-Didymium lenses, for absorbing yellow sodium flare, in shades No. 3, 4, 5, or 6; or Super Armorplate Calobar lenses of medium, dark or extra dark shades for persons working near welding.

### Blackmer Truck Pumps

TWO new rotary truck pumps, in capacities of 50 and 90 gal. per min., have been placed on the market recently by the Blackmer Pump Company, Grand Rapids, Mich., which can be used for a variety of emergency pumping service in and about terminals and at wrecks. In addition, they may be used to pump water from nearby streams for filling tank trucks used in construction work.

These new pumps have the bucket design swinging vane principle of operation that characterizes all Blackmer pumps, and have double anti-friction bearings, one on either side of the rotor, which eliminate practically all shaft "whip" and distortion. They are compact and light in weight, are designed for a standard power take-off drive, and will deliver their



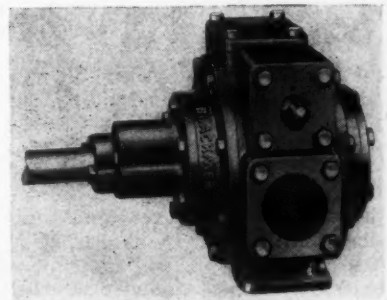
Right Side View of the Andover Auxiliary Power Unit

etc. They can also be used for flood-lighting night operations, and as standby units at points where facilities must be protected against a power failure.

This power unit weighs 116 lb. and consists of a 2-cylinder, 90-deg. V-type air-cooled engine of 10-15 hp. output, driving a 28.5-volt generator. It supplies a continuous power output of 5 k.w., with a peak load of 7½ k.w. for 5 minutes. The engine operates at a governed speed of 3,200 to 3,400 r.p.m. Its construction includes a one-piece aluminum alloy crankcase; two interchangeable steel cylinders with shrunk-on aluminum heads; one inlet and one exhaust valve in each head actuated by push rods from the camshafts; a single-

rounded to fit flush against the contour of the face; (2) improved nasal fittings, adding to comfort and safety; (3) side shields of a new design, which provide increased ventilation and help prevent fogging; (4) an easily-adjusted non-slip, one-piece headband, which resists perspiration, oil, water and grease; (5) shallow eyecups with deep sides, embodying the best balance obtainable between proper height for wider vision and adequate protection; (6) louvers designed to prevent stray light or sparks reaching the eyes; and (7) an easily-adjusted ball-chain bridge, covered with curved plastic tubing to fit snugly over the bridge of the nose.

As standard equipment, the new goggles are fitted with Noviweld



A Blackmer Rotary Truck Pump

rated capacity at 460 r.p.m. A relief valve is built into the pump casing and will bypass the entire capacity of the pump without end thrust on the working parts. The action of the

buckets is said to prevent loss of capacity during their life and they can be replaced easily when worn.

Suction and discharge connections are furnished for either 1½-in. or 2-in. iron pipe and, if desired, a strainer can be mounted at the suction intake of the pump, or at a convenient point in the suction line, remote from the pump.

## New Line of Rail Braces

THE Pettibone Mulliken Corporation, Chicago, has developed a new line of adjustable rail braces to provide maximum strength, minimum maintenance and longer service life, and which are said to have controlled flexibility, to be easily adjustable, to hold their adjustment, to support the head of the rail to prevent tipping, and also to withstand side thrust at the base of the rail. The new line of braces include four types: a two-bolt brace, a one-bolt brace, a boltless brace, and a curve brace. With the exception of

rosion-resistant steel and have smooth contact surfaces finished to make a close fit, thereby providing an assembly designed to give long life with little wear, and which will withstand stresses and vibration from traffic.

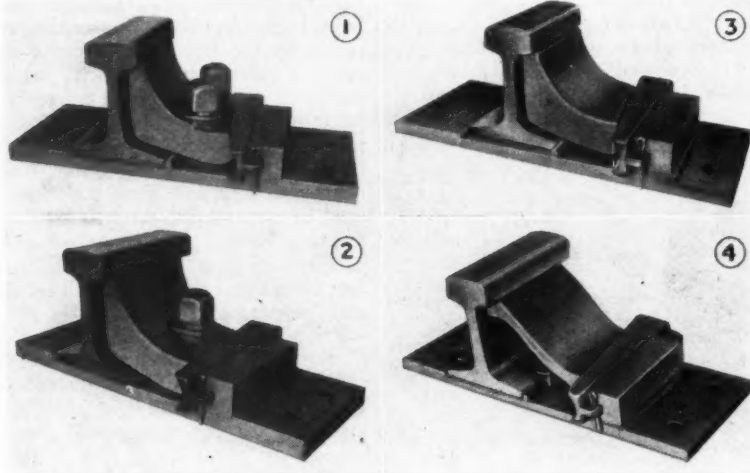
One of the features of these braces is the design of the brace and wedge pieces. The toe of the braces is rounded to fit a concave edge on the wedge and thereby provide a socket bearing for the toe of the braces. With this design, the rail and brace can work up and down together with the wave action of the rail under traffic and yet maintain continuous bracing. This design also provides a bearing area of 12 sq. in. for the brace.

Another feature of the design is a lug welded to one end of the brace piece, which extends downward over the edge of the tie plate. This insures a proper bracing position and prevents the brace from slipping when the wedge is being driven up tight. On the bolted braces, this feature keeps the bolts in a perpendicular position when the wedge is adjusted, thereby preventing them from being

advantage that the single bolt acts as a pivot under traffic, whereas the passage of traffic and the wave action of the rail have a tendency to loosen a two-bolt brace. Because of their design, the one and two-bolt braces are said to be effective even though the bolts become loose.

The boltless brace has the advantage that the maintenance required to keep bolts tight is eliminated. In addition, it is easily installed, adjusted or removed, and the elimination of the bolts allows the special design of the wedge and brace pieces to give full play to the wave motion of the rail and yet restrict tipping or side thrust. The design of this brace also permits single or double spiking on the outside of the stock rail, if desired.

The curve brace is similar to the boltless brace, except that the brace piece bears only under the ball of the rail and not against the base. It permits single or double spiking on both sides of the rail, and it can also be used on guard rails and in switches. The curve brace can be obtained with an insulated brace member to avoid interference with the indications recorded by rail detector cars.



(1) The Two-Bolt Brace; (2) The One-Bolt Brace; (3) The Boltless Brace; and (4) The Curve Brace

the bolts, nuts and washers, all four types consist essentially of four pieces; a special tie plate, a brace, a wedge and a key.

Briefly, the two-bolt, one-bolt and boltless braces fit against the side of the rail, bearing against the underside of the head and also against the base of the rail. The curve brace bears only against the underside rail head. In all four types, the toe of the brace fits against an adjustable wedge which, in turn, fits against a heavy, slotted shoulder on the brace plate. The wedge is held in place longitudinally by a cotter key.

The brace and wedge pieces are made of forged copper-bearing, cor-

rosion-resistant steel and have smooth contact surfaces finished to make a close fit, thereby providing an assembly designed to give long life with little wear, and which will withstand stresses and vibration from traffic. This lug also prevents the brace from slipping when the wedge is being driven up tight. On the outside edge of the rail base a higher welded shoulder prevents wide gage.

The bolted braces have square-head acorn nuts. In the two-bolt brace, these bolts are spaced far enough apart to permit 180-deg. turn when being tightened with a track wrench. The one-bolt brace is said to have the

## What Our Readers Think Not Guilty

Greenville, Pa.

TO THE EDITOR:

Referring to your letter on the subject of "Neglect," on page 690 of the August issue of *Railway Engineering and Maintenance*.

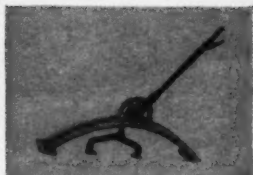
*Railway Engineering and Maintenance* is, as its name implies, a magazine devoted to railway engineering and railway maintenance. In my opinion, this magazine most admirably meets the requirements of those whom it is designed to help. My conclusion is that the subscriber who "laid you over a barrel" must necessarily not be a maintenance man. Therefore, if this subscriber is engaged in some other branch of railroading, I hardly see any justification in his criticizing a magazine devoted to work outside his field of endeavor.

As a member of the jury to which you refer in the last paragraph of your letter, my vote is a resounding "not guilty."

GEORGE L. SITTON,  
Ch. Engr. M.W. & S.,  
Southern.

(Continued on page 948)





**TIE NIPPER** — Securely grips, lifts and holds ties for spiking or tamping. Saves 1 man.



**RAIL BENDER** — One man bends up to 151 lb. "T" rail without heating.



**TRACK LINER** — Three men align more rail than 11 men with aligning bars.



**TRACK JACKS** — Sturdy, durable, jacks in many models speed up maintenance jobs.



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## 886 Billion miles

This staggering figure, estimated by I.C.C., represents the total ton miles to be handled by the railroads this year.

Maintaining the right-of-way for such tremendous travel requires the very best in track tools . . . sturdy, efficient, quality track tools built by BUDA will enable track crews to do a better job, quicker and easier. Write or wire for bulletins.

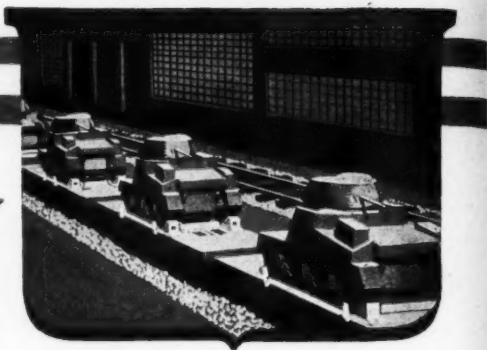


# BUDA

15403 Commercial Ave.  
Harvey (Chicago Suburb) Illinois

# NEWS

## of the Month



### Orders Purchases of Track Materials Reduced

The War Production Board has ordered all railroads, except transit lines, to reduce their purchase orders for track materials for the first half of 1945; the first quarter orders to be cut by 25 per cent, and the second quarter by 18 per cent. This action was taken in Direction 4 to Order P-142, which controls railroad maintenance requirements.

The announcement declared that the reductions have been made imperative because military requirements for overseas shipments of track materials, such as frogs and switches, have increased. The W.P.B. order also states that all 1945 orders, "even if already placed with suppliers," must be reduced immediately.

### M. R. S. Ready to Run German Railroads

When the time comes, America's soldier-railroaders will be ready, able and willing to run the German railroads, according to a recent statement of Brig. Gen. Andrew F. McIntyre, chief of the Rail division of the Army Transportation Corps. The general, speaking in a Mutual broadcasting system interview, said that "Military Railway Service troops are keeping pace with the Allied advances in the European theater of operations."

By the end of the year, he said, the Military Railway Service will have about 4,000 American locomotives and 60,000 freight cars operating outside the United States. He also revealed that the Army Transportation Corps now has a personnel strength of more than 350,000. Four thousand of these are WAC's serving with the Corps in this country, he added, and several hundred more are stationed in the European theatre.

### I.C.C. Report on A. C. L. Derailment

The derailment of an Atlantic Coast Line train at Stockton, Ga., on August 4, in which 47 maintenance of way employees were killed and 40 more were injured, as reported in the September issue of *Railway Engineering and Maintenance*, was caused by a broken rail, as a result of the presence of transverse fissures, according to a report of the Interstate Commerce Commission, dated August 29. The report stated that "the track involved was last inspected by the section foreman

about 36 hours prior to the accident, but no defective condition was observed," and that "a detector car was last operated over this territory on August 7, 1943."

The report also stated that from January 1, 1940, to June 30, 1944, this railroad had reported to the Commission 61 accidents caused directly or indirectly by broken rails. "These accidents," said the report, "indicate the operation of trains is such that excessive stresses are being exerted upon the track structure."

### W.P.B. Cuts Fourth-Quarter Steel Outlay

Controlled materials for domestic transportation in this year's fourth quarter have been reduced by about one-third from the amounts requested by the Office of Defense Transportation, the principal factor being an anticipated sharp reduction in the allocations for rail and track accessories. O.D.T., as claimant agency for the domestic transportation industry, asked for 1,532,633 short tons of carbon steel, but has been advised by the War Production Board that its allotment will be 1,039,100 tons.

The new replacement-rail request was cut from 550,000 tons to 360,000 tons, and allocations for track accessories from 291,000 tons to 190,000 tons, "because of demands on rail mills for shell steel and rails for the military."

The announcement of the fourth-quarter allocations said that O.D.T. had been told that, "in making this decision, the W.P.B. recognized the necessity of increasing the allotment of new replacement rail and accessories as soon as war demands permit."

### Railroad Personnel Needs Show Decrease

Personnel needs of the railroad industry declined to 94,000 on August 1, compared with 98,000 on July 1, according to a recent estimate made by the Railroad Retirement Board. The figure for August is based upon reports from 187 employers who reported shortages of 88,000 workers. In some areas, the Board reported, agricultural workers became available for railroad work on a temporary basis during July, and in some other areas there were indications that the new Priority referral program tended to reduce turnover. Meanwhile, placements of workers in the railroad indus-

try continued at a high level everywhere.

The reports for the last four months have indicated that labor shortages in the industry have eased progressively. They were 14,000 less on August 1 than on April 1. Data from employers reporting in both months indicate that fewer additional workers were needed in every occupational group. For laborers, most of a 4 per cent decrease resulted from reductions in shortages of track laborers, but there were also fewer vacancies in a majority of the other laborer occupations.

### Railroads Are Facing Extra Heavy Freight Job

While they continue to carry an all-time record load of freight, the railroads still face the fall peak, the winter weather with its adverse effect on operating efficiency, and war transportation demands, which "promise to be more exacting than ever," according to an August 20 statement issued by Colonel J. Monroe Johnson, director of the Office of Defense Transportation. The O.D.T. director also mentioned "the great volume of non-military freight," attributing it to "the enormous wartime stimulation of production of farm crops, of basic raw materials, and of the miscellaneous commodities demanded by workers with more money to spend."

Freight gross ton-miles for the first half of 1944, the statement pointed out, amounted to 883 millions, an increase of five per cent over the first half of 1943, 19 per cent over 1942, and 106 per cent over 1939. The carloading total for the year's first 32 weeks was given as 26,303,164 cars, as compared with 25,280,011 in the same 1943 period.

Colonel Johnson's prediction that the direct military demands for transportation may become more exacting is based upon his expectation that "the broadening out of the invasion from Normandy and Mediterranean beachheads to the roads to Paris and the Rhine will call for more rapid expenditure of ammunition and fuel, increased destruction of equipment, and more need for haste in rushing supplies to the front."

"Even the sudden collapse of Germany," he added, "would not necessarily bring relief to our railroads, as it would mean the turning of the tide of rail transportation toward the Pacific, instead of the Atlantic, with the consequent longer hauls."

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MEMBER





## Changes in the Editorial Staff of Railway Engineering and Maintenance and Associated Simmons-Boardman Publications



**Neal D. Howard**  
*Editor*

Following the death on September 1 of Elmer T. Howson, editor of *Railway Engineering and Maintenance*, editor of the *Railway Engineering and Maintenance Cyclopedica*, and western editor of *Railway Age*, eight changes in the editorial and business staffs of these Simmons-Boardman Publishing Corporation publications have been announced by Samuel O. Dunn, chairman of the board of the corporation. The changes are as follows:

**Neal D. Howard**, managing editor of *Railway Engineering and Maintenance*, and engineering editor of *Railway Age*, has been advanced to editor of *Railway Engineering and Maintenance*, with headquarters as before at Chicago, and will continue as engineering editor of *Railway Age*; **S. W. Hickey**, sales representative at Chicago has been advanced to western manager, advertising sales, and business manager of *Railway Engineering and Maintenance*, with the same headquarters; **Merwin H. Dick**, eastern editor of *Railway Engineering and Maintenance*, and eastern engineering editor of *Railway Age*, with headquarters at New York, becomes managing editor of *Railway Engineering and Maintenance*, and western engineering editor of *Railway Age*, with headquarters at Chicago; **John S. Vreeland**, associate editor of *Railway Engineering and Maintenance* and of *Railway Age*, with headquarters at Chicago, becomes eastern editor of the former and eastern engineering editor of the latter publication, with headquarters at New York, succeeding Mr. Dick; **C. Miles Burpee**, purchase and stores editor of *Railway Age*, also becomes editor

**Neal D. Howard Becomes Editor, and S. Wayne Hickey Takes on Added Duties of Business Manager. Merwin H. Dick and John S. Vreeland Move Up**

of the *Railway Engineering and Maintenance Cyclopedica*, with headquarters as before at Chicago; **Charles Layng**, transportation editor of *Railway Age*, has been promoted to western editor, with headquarters as before at Chicago; and **C. W. Merriken**, sales representative, has been promoted to business manager of the *Railway Engineering and Maintenance Cyclopedica*, with headquarters as before at Chicago.

Mr. Howard was born at Rochester, N. Y., on December 23, 1898, and received his higher education at Rensselaer Polytechnic Institute, from which he was graduated in 1922 with the degree of Civil Engineering. Immediately following graduation, he entered the service of the Illinois Central on its St. Louis division, as a chairman, with headquarters at Carbondale, Ill., and on June 4, 1923, he was promoted to rodman, with the same headquarters. During his service on the Illinois Central, which extended until August 15, 1924, Mr. Howard was engaged in both construction and maintenance of way work, and made many performance studies of gang organizations and of units of work equipment. On the latter date, he left the road to become associate editor of the 1926 edition of the *Railway Engineering and Maintenance Cyclopedica*, published by the Simmons-Boardman Publishing Corporation, with headquarters at Chicago, and in August, 1926, he was appointed eastern engineering editor of the *Railway Age* and eastern editor of *Railway Engineering and Maintenance*, at New York, where he was located until March, 1938, when he was promoted to managing editor with headquarters at Chicago, the position he held at the time of his new appointment. Mr. Howard is a licensed professional engineer in the State of New York, and is a member of the American Railway Engineering Association, the Western Society of Engineers, the Roadmasters' and Maintenance of Way Association, the American Railway Bridge and Building Association (of which he is second vice-president), and the Maintenance of Way Club of Chicago (of which he is secretary-treasurer).



**S. Wayne Hickey**  
*Business Manager*

Mr. Hickey was born at Camden, Ark., on Dec. 7, 1905, and received his higher education at the University of Arkansas. He entered railroad service in April, 1925, as a gravel and ballast inspector on the Illinois Central, subsequently serving as a chairman, rodman and valuation accountant on the same road. In April, 1931, Mr. Hickey became associated with the Simmons-Boardman Publishing Corporation as a member of its circulation department at Chicago, and in December, 1936, he was advanced to sales representative, the position he held at the time of his new appointment. Mr. Hickey is a member of the Dotted Line Club, the Chicago Industrial Advertisers' Club, the National Industrial Advertisers' Association, the Chicago Federated Advertisers Club, the Western Railway Club, and the Maintenance of Way Club of Chicago.

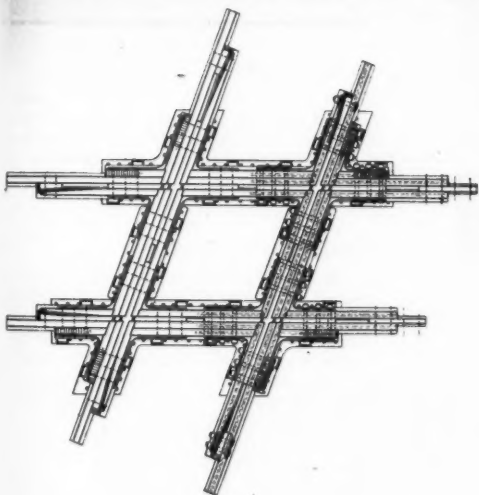
Mr. Dick was born on August 19, 1906, at Newton, Kan., and was educated at the University of Kansas, graduating in 1928 with a Bachelor of Science degree in civil engineering. He entered railway service in 1924 as a chairman on the staff of the division engineer of the Atchison, Topeka & Santa Fe at Newton, and during ensuing summer vacations he served as a chairman and rodman at this point, at Arkansas City, Kan., at Chanute, Kan. After graduation he returned to this company as a rodman, which position he held until October, 1929, when he resigned to go with the Simmons-Boardman Publishing Corporation as associate editor of the *Railway Age* and of *Railway Engineering and Maintenance*, with headquarters at Chicago. In 1937 he

(Continued on page 952)



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was promoted to eastern editor of *Railway Engineering and Maintenance* and eastern engineering editor of *Railway Age*, with headquarters at New York.

Mr. Vreeland was born on November 16, 1907, at Cincinnati, Iowa, and received his



Merwin H. Dick

higher education at Iowa State College, Ames, Iowa, from which he was graduated in 1928 with the degree of Bachelor of Science in Chemical Engineering. His railroad career, all of which was with the Rock Island, started in June, 1926. He worked that summer and also the following summer in the engineering department of that road between terms at school. Following graduation from college in 1928, Mr. Vreeland was appointed a rodman on the Rock Island with headquarters at



John S. Vreeland

Cedar Rapids, Iowa. He was later promoted to instrumentman and worked on the Iowa division and on the construction and location of the Coburn-Birmingham line, with headquarters at Polo, Mo. In June, 1931, he was appointed inspector, checking the joint facility accounts of that road with the Chicago, Burlington & Quincy. In October of that year he was transferred to the Missouri division, with headquarters at Trenton, Mo. In June, 1933, Mr. Vreeland was appointed a supervisor of track, which position he held successively on the Oklahoma division at Booneville, Ark., on the Iowa division at Des Moines, Iowa, and on the Missouri-Kansas division, with headquarters at

Eldon, Mo. In May, 1938, he became associated with the Simmons-Boardman Publishing Corporation as associate editor of *Railway Engineering and Maintenance* and of *Railway Age* at Chicago, the position which he has held up to the time of his new appointment.

Mr. Burpee was born at Edmunston, N. B., on August 18, 1900, and was graduated from the University of New Brunswick in 1923. His first railway experience was gained during the summers of 1918 to 1920, when he was employed in the maintenance of way department of the Canadian National. During the summers of 1921 to 1923 he was employed by the department of public works of the Province of New Brunswick as resident engineer on highway construction. In the following year he was associated with Marquette University, Milwaukee, Wis., as instructor of surveying, descriptive geometry and drawing. On July 1, 1924, he entered the employ of the Delaware & Hudson as bridge and building supervisor on the Penn-



C. Miles Burpee

sylvania division, and later served as track supervisor on the Susquehanna division. In 1928, he was appointed bridge and building master of the Saratoga division, and in April, 1930, he was promoted to purchasing engineer. In May, 1933, he was advanced to research engineer in the purchasing department, with headquarters at Albany, N. Y., his duties consisting of the application of research in connection with the purchase and use of materials, as well as the purchase and supervision of inspection of all forest products. In 1938 he resigned from the D. & H. to become managing editor of the *Railway Engineering and Maintenance* Cyclopedic, and in August, 1943, he was appointed purchases and stores editor of *Railway Age*, the position he held at the time of his new appointment.

Mr. Layng worked in various capacities in the traffic, mechanical and operating departments of the Southern until 1922, when he became associate editor of the *Railway Review* at Chicago. In 1923 he was promoted to assistant managing editor and three years later he was advanced to managing editor. In 1926, when the Simmons-Boardman Publishing Corporation took over that publication and consolidated it with *Railway Age*, Mr. Layng was appointed transportation editor. During his years with the latter publication, he has been loaned as an economist to the

Western Association of Railway Executives and has also done considerable research work for the Association of American Railroads.

Mr. Merriken was born at Baltimore, Md., on August 12, 1907, and received his higher education at the University of Illinois. He entered railway service in 1930 as a chairman of the Chicago & North Western, and one year later he went with the Chicago, Milwaukee, St. Paul & Pacific, as a rodman at Chicago. From 1932 to 1935 he was associated with the sales department of the Pure Asphalt Company at Chicago, and in the latter year he returned to the North Western as a rodman on the Galena division. In March, 1938, Mr. Merriken went with the Belt Railway of Chicago as a rodman, and in October of the same year he resigned to become an associate editor of the *Railway Engineering and Maintenance* Cyclopedic. On March 4, 1940, he was appointed to the position he held at the time of his new promotion.

## Association News

### Wood Preservers' Association

The Executive committee of the association will meet in the Stevens Hotel, Chicago, on October 18, in conjunction with the one-day Executive meeting of the American Railway Bridge and Building Association, on that date.

### Roadmasters' Association

The Executive committee of the association held a one-day business meeting in Chicago on September 20. A written report of the activities at this meeting, together with all six of the technical reports presented at and acted upon at this meeting, are presented elsewhere in this issue.

### Maintenance of Way Club of Chicago

The first fall meeting of the club will be held on Monday, October 23, in the Ambassador Room of Huyler's Restaurant in the Straus Building, 310 S. Michigan Ave., Chicago. Dinner will be served at 6:30 p.m. and will be followed by a program which promises to be of timely interest. The work on the annual Year Book is nearing completion and will be mailed to members soon.

### Bridge and Building Association

Replacing its annual meeting, which was to have been held in Chicago on October 17-19, the association will hold a one-day business meeting in Chicago of its Executive committee, the chairman and members of its technical committees, and such other members and other railway men in the Chicago area who may find it possible attend without train travel or interfering with their work. This meeting, which will be held on October 18 at the Stevens Hotel, will receive



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and act upon the current reports of all technical committees and will organize the work of the association for the ensuing year.

The reports to be considered at the meeting are as follows: Post-War Values of War-Time Practices in Bridge, Building and Water Service Activities; Increasing the Capacity of Water Service Facilities to Meet Demands of Heavier Traffic; Keeping Work Equipment in Service; New Possibilities in Building Designs and Materials; Bridge Inspection in the Light of Current Restricted Maintenance; The Year's Developments in the Treatment of Timber to Increase Its Fire Resistance; and Welding in Bridge, Building and Water Service Work.

### American Railway Engineering Association

Three committees of the association plan meetings during October, as follows: the Committee on Water Service, Fire Protection and Sanitation, at Chicago on October 17; Masonry, at Chicago on October 17-18 (tentatively); and Buildings, at New York on October 24 and 25.

As the result of the death of Elmer T. Howson on September 1, who was a director of the association, chairman of its Committee on Co-Operative Relations With Universities, chairman of its Publication committee, and a member of the Finance committee of the Board of Direction, R. E. Dougherty, vice-president, New York Central System, has consented to serve as temporary chairman of the Committee on Co-Operative Relations With Universities; R. A. Van Ness, bridge engineer system, Atchison, Topeka & Santa Fe, has been appointed chairman of the Publications committee; and J. B. Akers, assistant chief engineer, Southern Railway System, has been appointed a member of the Finance committee. In addition, B. R. Kulp, chief engineer, Chicago & North Western, has been appointed the third member of the Publications committee.

Beginning with October, the association will publish a monthly news bulletin, to be known as the A.R.E.A. News, a new feature in its publications, designed to promote increased interest among members by apprising them currently of activities of the association and its personnel.

Five committees held meetings during September, as follows: Track, at Chicago on September 21; Yards and Terminals, at Cleveland, Ohio, on September 21; Economics of Railway Location and Operation, at Chicago on September 26-27; Maintenance of Way Work Equipment, at Chicago on September 26-27, and Economics of Railway Labor, at Chicago, on September 28.

The principal publication of the association during the month was Bulletin No. 447, which was sent to members late in the month. This bulletin, of 316 pages, is devoted exclusively to a report on Counterbalance Tests of Locomotives for High-Speed Service, prepared under the joint supervision of W. I. Cantley, mechanical engineer, Mechanical division, A.A.R., and G. M. Magee, research engineer, Engineering division, A.A.R.

## Personal Mention

### General

**Sherman Smith**, superintendent of the Calgary division of the Canadian National, and an engineer by training and experience, with headquarters at Calgary, Alta., has retired after 34 years of service.

**Howard H. Clark**, assistant division superintendent on the Erie, at Chicago, and a maintenance officer by training and experience, has been promoted to superintendent of the Kent division, with headquarters at Marion, Ohio.

### Engineering

**William H. B. Bevan**, acting district engineer on the Canadian National, with headquarters at Montreal, Que., has been promoted to district engineer on the Northern Ontario district, with headquarters at North Bay, Ont.

**Horace W. Flemming**, district engineer on the Northern Ontario district of the Canadian National, with headquarters at North Bay, Ont., has been transferred to the Southern Ontario district, with headquarters at Toronto, Ont., succeeding **Henry E. Smith**, who has been transferred to Montreal, Que. Mr. Smith replaces **W. H. B. Bevan**, who relieves Mr. Flemming at North Bay.

**L. C. Smith**, supervisor of bridges and buildings on the Northern Iowa division of the Chicago & North Western, with headquarters at Mason City, Iowa, has been appointed acting division engineer on the Black Hills division, with headquarters at Chadron, Neb., succeeding **H. L. Holderman**, whose promotion to supervisor of wood preservation, with headquarters at Escanaba, Mich., is reported elsewhere in this issue.

**Raymond J. Pierce**, assistant division engineer on the Erie, with headquarters at Buffalo, N.Y., has been promoted to division engineer, with headquarters at Dunmore, Pa., succeeding **Arthur Price**, who has been transferred to the Marion division, with headquarters at Huntington, Ind., replacing **Louis Rossman**, who has entered military service as a lieutenant-colonel in the Transportation Corps.

**B. S. Converse**, assistant engineer on the Galena division of the Chicago & North Western, with headquarters at Chicago, has been promoted to division engineer on the Sioux City district and the Iowa and Northern Iowa divisions, with headquarters at Sioux City, Iowa, succeeding **A. E. Benson**, who has been assigned to other duties.

Mr. Converse was born at Joliet, Ill., on January 3, 1907, and graduated from Purdue University in 1929. He entered railway service with the North Western as a rodman on the Galena division on March 4, 1936, and one year later he was advanced to instrumentman on the Black

Hills division, with headquarters at Chadron, Neb. On October 1, 1938, Mr. Converse was transferred to Sioux City, and on December 1, 1941, he was promoted to assistant engineer on the Black Hills division, with headquarters at Chadron. On May 1, 1943, he was transferred to the Galena division, remaining in that location until his new appointment.

**H. H. Hall**, assistant general bridge inspector of the Chicago & North Western, with headquarters at Chicago, has been promoted to division engineer on the Western division of the Chicago, St. Paul, Minneapolis & Omaha (part of the North Western System), with headquarters at St. Paul, Minn., succeeding **W. H. Huffman**, who has been appointed acting division engineer of the Eastern division of the C. St. P. M. & O. with headquarters also at St. Paul. Mr. Huffman replaces **H. W. Jensen**, who has been granted a leave of absence to enter military service.

### Track

**C. W. Butts** has been appointed supervisor of track on the Gulf, Mobile & Ohio, with headquarters at Murphysboro, Ill.

**Norman W. Kopp**, assistant supervisor of track on the Mississippi division of the Illinois Central, has been promoted to supervisor of track, with headquarters at Grenada, Miss.

**D. R. Crawford**, assistant supervisor of track on the Chesapeake & Ohio, has been promoted to supervisor of track of the New River district, with headquarters at Hinton, W. Va., effective September 16, succeeding **R. C. Patton** who has retired.

**J. A. Gerboth**, roadmaster on the Omaha division of the Missouri Pacific, with headquarters at Falls City, Neb., has been transferred to the Southern Kansas division, with headquarters at Arkansas City, Kan., succeeding **L. E. Laird**, who has been transferred to the Omaha division.

**Fred A. Chinquist**, district roadmaster on the Great Northern, with headquarters at Grand Forks, N.D., has been promoted to division roadmaster, with the same headquarters, succeeding **Cornell Halverson**, who has been transferred to Willmar, Minn. **T. C. Basterash**, assistant to the superintendent of the Dakota division at Grand Forks, has been advanced to district roadmaster, with the same headquarters, replacing Mr. Chinquist.

**W. J. Driscoll**, assistant supervisor of track on the Eastern division of the Alton at Bloomington, Ill., has been promoted to supervisor of track on the Western division, with headquarters at Slater, Mo., succeeding **M. H. Murphy**, who has retired. **H. Silvernail**, track master at Bloomington, has been advanced to assistant supervisor of track, with the same headquarters, replacing Mr. Driscoll.

**John E. Spangler**, assistant engineer in the office of the engineer of track of the New York Central, Lines Buffalo and East, with headquarters at New York, has been appointed supervisor of track of Subdivision 27 of the Pennsylvania division, with headquarters at Clear-

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field, Pa., succeeding **Clarence M. Gregg**, who has been transferred to Subdivision 8 of the Mohawk division, with headquarters at Oneida, N.Y. Mr. Gregg replaces **Marcel H. LaRouche**, who has been transferred to Subdivision 7 of the Mohawk division, with headquarters at Utica, N.Y., to succeed **F. L. Vault**, who has retired. **Wolters Ledyard**, a draftsman in the office of the engineer maintenance of way, Lines Buffalo and East, at New York, has been promoted to assistant supervisor of track of Subdivision 30 of the Buffalo division, with headquarters at Rochester, N.Y., to succeed **W. R. Benish**, who has been transferred to Subdivision 5 of the Mohawk division, with headquarters at Albany, N.Y. Mr. Benish succeeds **James R. Watt, Jr.**, whose appointment as assistant engineer at New York is noted elsewhere in these columns.

### Bridge & Building

**R. E. Jacobus**, building inspector on the Iowa division of the Illinois Central, with headquarters at Waterloo, Iowa, has been appointed acting supervisor of bridges and buildings, with the same headquarters, succeeding **J. E. Sallis**, who has been granted a leave of absence due to illness.

### Obituary

**George Nelson Edmondson**, who retired in September, 1943, as chief engineer, maintenance of way, of the New York Central, died on August 11 at Short Beach, Conn. He was 64 years old. A photograph and biographical sketch of Mr. Edmondson appeared in the November, 1943, issue, at the time of his retirement.

**E. R. Lewis**, retired principal assistant engineer of the Michigan Central, whose death on August 13 was reported in the September issue, was born at Raritan, N.J., on November 20, 1869, and graduated from the University of Iowa in 1890. He entered railway service in 1895 as an axeman and rodmán on construction on the Missouri Pacific, subsequently serving as a levelman and clerk in the timber department. He was promoted to division engineer in 1891 and left railroad service the following year to become a reclamation engineer in Wyoming. From 1892 to 1905, Mr. Lewis was engaged in engineering work for the United States government and for the Cape Government Railways in Cape Colony, South Africa, except for a short period between 1901 and 1903, when he was consecutively engineer in charge of construction of the White River Railroad (now part of the Missouri Pacific) at Batesville, Ark., and engineer in charge of location and construction of the Fort Smith & Western. In 1905 he was appointed assistant engineer of the Keweenaw Central (now a part of the Copper Range), with headquarters at Hancock, Mich., and in August, 1906, he was appointed division engineer on the Michigan Central, with headquarters at Bay City, Mich. In June, 1912, he was appointed assistant to the general manager of the Duluth, South

Shore & Atlantic, and in July, 1918, was promoted to chief engineer. He became managing editor of the Maintenance of Way Cyclopaedia (now the *Railway Engineering and Maintenance Cyclopaedia*, published by the Simmons-Boardman Publishing Corporation) in March, 1919, and upon the completion of this work was appointed office engineer of the Michigan Central in March, 1921. Mr. Lewis was promoted to principal assistant engineer, with headquarters at Detroit, on January 1, 1924, and in June, 1933, he was appointed office engineer, the position he held at the time of his retirement.

## Supply Trade News

### General

**Fairbanks, Morse & Co.**, Chicago, has purchased the **Pomona Pump Co.**, a division of the Joshua Hendy Iron Works, in a \$4,000,000 transaction. **R. H. Morse, Jr.**, general sales manager, announced on September 6. The acquisition included all physical assets, patents and trade marks. The Pomona Company has plants in St. Louis, Mo., and Pomona, Cal. No change in factory or sales personnel of the Pomona Company is contemplated.

### Personal

**Howard E. Isham**, assistant treasurer of the **United States Steel Corp. of Delaware**, has also been appointed assistant vice-president.

**Robert L. Irvin** has been appointed works manager of the Graham plant of the **Pittsburgh Screw & Bolt Corp.** to succeed **George H. Lee, Sr.**, who will devote his time to experimental and advisory work for all plants of the corporation.

**Fred W. Evinger**, formerly in the engineering department of the Union Pacific, has been appointed railway sales representative for the **Patterson-Sargent Company** in the Chicago, west and northwest district, to succeed **George W. Anderson**, who has retired.

**Howard C. Sauer** has rejoined the **Timken Roller Bearing Company** as general manager of its newly-created foreign division with offices in Canton, Ohio. Mr. Sauer was chief of the anti-friction bearing section of the tools division of the War Production Board from September, 1941, to September, 1944.

Three appointments to executive positions in the sales and advertising departments of the **Philip Carey Manufacturing Company**, Cincinnati, Ohio, have been announced by **E. W. Smith**, vice-president and general sales manager. **Harold D. Bates** has been appointed advertising and sales promotion manager; **Chester L. Owens**, manager of the company's Cincin-

nati branch office, has been promoted to assistant general sales manager, and **George B. Johnston**, manager of the Marketing division, has been advanced to general merchandising manager. Prior to his new connection Mr. Bates was assistant advertising and sales promotion manager of **Johns-Manville**, with headquarters at New York.

**Leon C. Reed**, manager of the Chicago district sales office of the **Inland Steel Company**, Chicago, has been promoted to assistant manager of the Railroad Sales division. **Kenneth J. Burns**, assistant to the manager of the Plate and Shape Sales division, has been promoted to Chicago district sales manager.

**W. K. Cox**, manager of the Eastern division of the **Caterpillar Tractor Company**, Peoria, Ill., has been promoted to assistant general sales manager. **William S. Ziegler**, assistant sales manager of the Eastern division, has been advanced to manager of that division, succeeding Mr. Cox, and **F. D. Haberkorn**, the company's representative in Texas and Oklahoma, has been promoted assistant sales manager of the Eastern division, replacing Mr. Ziegler.

At the annual meeting of stockholders of the **LaPlante-Choate Manufacturing Company**, held on August 31, the following new directors were elected: **Alfred Kauffman**, former president and a current director of the Link Belt Company, Chicago; **Roy Fruehauf**, executive vice-president of the Fruehauf Trailer Company, Detroit, Mich.; **Howard Hall**, president of the Iowa Manufacturing Company and Iowa Steel & Iron Works, Cedar Rapids, Iowa; **Owen E. Elliott**, senior partner in the law firm of Elliott, Shuttleworth & Ingersoll, Cedar Rapids, and **Archie D. Dennis**, secretary-treasurer of the company. Mr. Kauffman will serve as Chairman of the Executive committee of the new board of directors.

### Obituary

**John P. Mosea**, formerly manager of railroad sales for **Joseph T. Ryerson & Son**, died August 18 in Chicago.

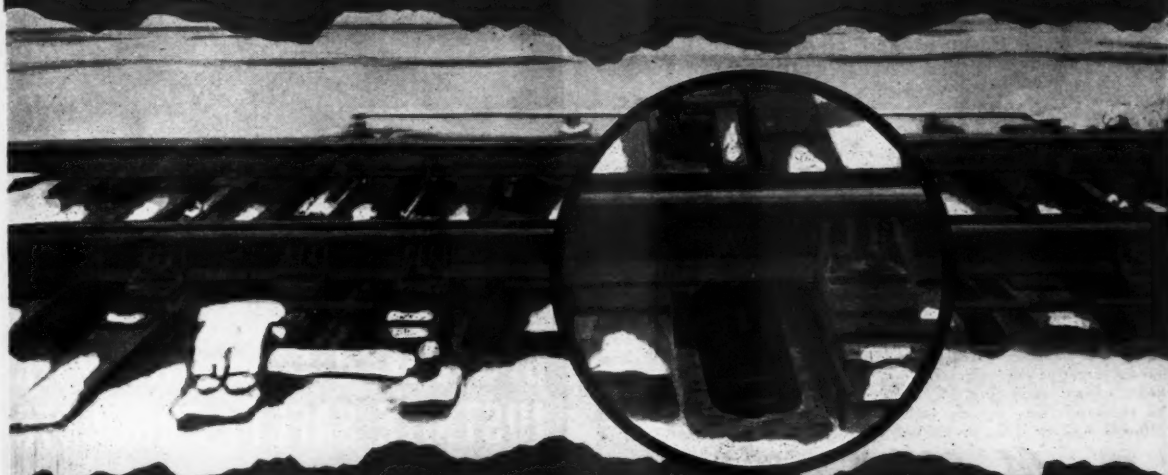
**John C. Dilworth**, manager of sales in the railroad materials and commercial forgings division of the Pittsburgh and Chicago districts of the **Carnegie-Illinois Steel Corporation**, died on August 23, in Pittsburgh, Pa.

**Harry Scott Wherrett**, chairman of the board of directors of the Pittsburgh Plate Glass Company, died August 13. He was 68 years of age. Mr. Wherrett began his career with the Pittsburgh Plate Glass Company as an office boy 53 years ago.

**W. W. Fitzpatrick**, field manager of the **Nordberg Manufacturing Company**, with headquarters at Chicago, died in that city on September 21. Mr. Fitzpatrick was 49 years old and went with the Nordberg Manufacturing Company in March, 1927, after previous service with the Chicago, Rock Island & Pacific. He served as general sales representative at Chicago and recently was advanced to field manager.

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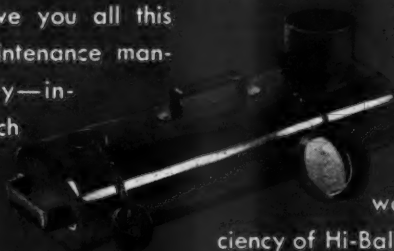
The best you can ask of a switch heater is dependability—that it will keep on doing its job day in and day out—24 hours a day—with the minimum of attention and upkeep.

Hi-Ball Switch Heaters give you all this and more. They reduce maintenance man-hours. They promote safety—increase production hours. Each unit operates 30 to 40 hours on less than 1½ gallons of kerosene, making it possible to service them when convenient.

Hi-Ball Heaters come in self-contained units, are more economically installed, have low maintenance costs, eliminate fire hazard, pre-

vent flame blow-outs, and control the application of heat.

If the cold-weather performance of your switches is a problem, you will find the answer in Hi-Ball Switch Heaters. It will pay you to find out about them now—before you need them. The most satisfactory way to demonstrate the efficiency of Hi-Ball is to make a test installation—it costs little and will show you more than we could ever do in words. Send for complete information today or arrange for a test installation.



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RAILWAY EXCHANGE BLDG., CHICAGO 4, ILL.

## METAL DRILLING Shifts into HIGH with 1/4"



**Mall Drill**  
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For Drilling:**

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Powerful • Dependable • Economical

A light weight, high-speed, cool-running, pistol-grip drill ruggedly constructed for continuous hard usage. Weighs only 3 pounds without cord. It is short, compact and perfectly balanced for use with either hand. Exceptionally efficient in close quarters. Special steel alloy gears assure longer life. Commutator easily serviced. Brushes can be replaced from outside without dismantling drill. Available for 110-volt A.C. or D.C., or 220-volt A.C. or D.C.



## Mall 6 H. P. Off-the-Track PORTABLE RAIL GRINDER

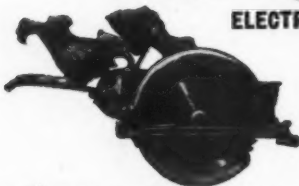
This easily portable rail grinder will pay for itself in a short time in savings on rail and road bed maintenance, reduced shock on rolling stock, and better acting and fitting switches.

The 6 H.P. variable speed gasoline engine and heavy duty flexible shafting make the unit readily adaptable to rail joint, frog, crossing, and switch point grinding. Engine starts easily, requires little attention and uses very little fuel. Unit is ruggedly constructed for long, hard usage. Patented slip-lock detail on ends of flexible shaft

and various attachments reduces tool changing time to a minimum.

## 12-INCH Mall Saw

**ELECTRIC and PNEUMATIC MODELS**



A powerful saw with 12" blade for cross-cutting, ripping and beveling planks and timbers. Cutting capacity 4 1/2" on straight cuts. Has safety guard and blower to keep cutting line clear.

Other MALL Portable Power Tools include Cross Slotters, Gasoline Engine, Pneumatic and Electric Concrete Vibrators and Surfacers, Gasoline Engine and Pneumatic Chain Saws, Flexible Shaft Machines with attachments for sanding, grinding, polishing, wire brushing, buffing and drilling. Write for complete catalog to



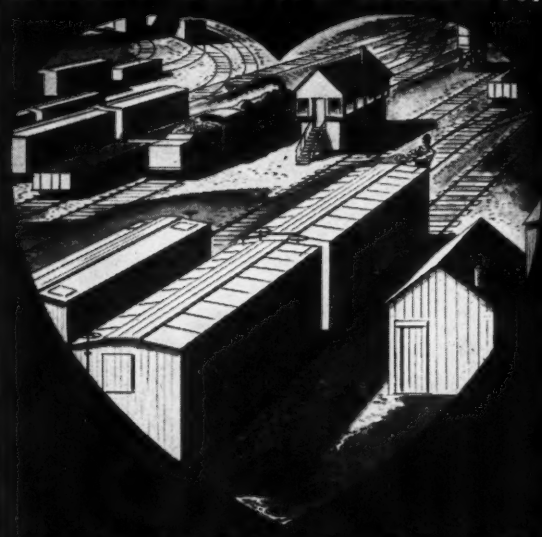
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MALL TOOL COMPANY**

7746 South Chicago Avenue, Chicago 19, Illinois  
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**Mall**  
REG. U.S. PAT. OFF.

**PORTABLE  
POWER TOOLS**

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JUSTRITE SAFETY PRODUCTS**

**C**ONTROL TOWERS, tool sheds, barns, storage buildings, roundhouses, or other vital spots where flammable materials are handled or stored are all potential fire hazards.

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*Justrite Safety Can*



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SAFETY CANS • FILLING CANS • OILY WASTE CANS  
APPROVED SAFETY ELECTRIC LANTERNS







Model P-6 Railway Track-work Grinder

## Post-war Problem Number One... Maintaining Through Rail Service

With victory will come new traffic demands calling for uninterrupted service over unobstructed track. To a large extent, heavily used rails must be made to serve until new are available—and that's where these Railway Track-work Grinders can help in their maintenance.

● Model P-6 is a portable, gasoline engine-driven Grinder for removing surplus metal deposited on rails, for building up cupped joints, frogs and crossings, by electric arc or gas welding. A power take-off permits connecting a flexible shaft for operating hand piece attachments for cup wheel or for straight wheel and cross grinder.

● Model P-16 is a portable, gasoline engine-driven rail Grinder for removing overflowed metal from switch points and stock rails. Furnished with auxiliary flexible shaft, if desired, for grinding in the flange-way of frogs and dressing the extreme end of switch points. Also available for longitudinal rail head slotting and inserting copper strips to prevent rust from affecting proper functioning of signal circuits at infrequently used turn-outs and crossovers.

Assure efficient track maintenance with least time-out, less labor and cost . . . by using Railway Track-work Grinders. Write for latest bulletin for full information on the many models available.

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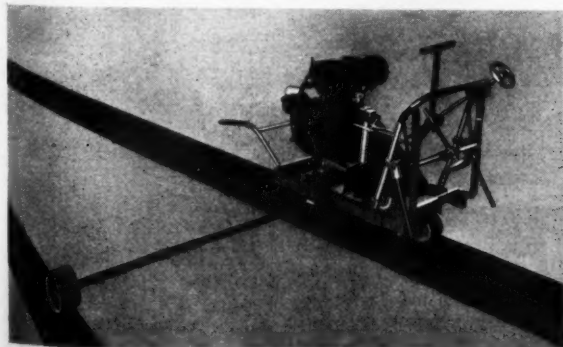


## Railway Trackwork Co.

3132-48 East Thompson St., Philadelphia, Pa.

Model P-16 Railway Track-work Grinder

6512



Railway Engineering and Maintenance



## A WAR-TIME SAVING WITH BURRO CRANES

In war-time, when railroad equipment is taxed to capacity, Burro Cranes eliminate much use of locomotives and work-trains—for Burros do their own switching and hauling—load or unload cars they are coupled to—go rapidly under their own power from job to job. Consider these features.

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2. Independent clutches for each operation. Each can be done separately or simultaneously with others.
3. Drawbar pull up to 7500 lbs. enables it to do its own hauling and switching.
4. Travels 1.3 to 2.2 miles per hour. Wastes no time between jobs. Hauls men with tools, eliminates use of work train.
5. Elevated boom heels allow standard boom to do the work of a 30' boom handling 39-ft. rails in 5-ft. gondola cars coupled to crane, yet crane can be loaded onto a 46' flat car.
6. Overall height is low enough so it can be used on a car in a work or supply train.
7. Can set itself off track in 2 minutes to permit a train to go by. Sets itself on again in same time.

Because of Burro's wide operating range—its great flexibility and adaptability to many requirements, it quickly earns its way and saves you many dollars in operating costs besides.

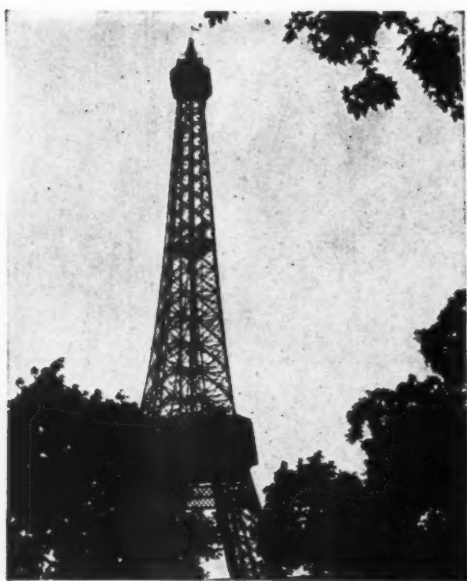
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## CULLEN-FRIESTEDT COMPANY

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*In Paris . . .*

LAYNE WELLS AND PUMPS

*... are still on the job!*

Surviving the days of ruthless enemy occupation, Layne Wells and Pumps are still on the job! With the exception of some cases of sabotage or wilful enemy destruction, those Layne Wells and Pumps are still producing somewhere near 90,000,000 gallons of water daily.

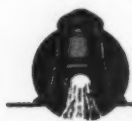
The Paris wells are 3,000 feet deep, with their corrosive proof, Layne built shutter screens set in the famed green sands formation. They were installed in 1928-29 by Layne-France Company, one of Layne's many affiliated companies. The city officials of Paris, after thorough investigation, selected Layne Wells and Pumps from a field of the keenest world-wide competition. Their confidence in the equipment has been more than justified.

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Layne Well Water Systems have also made great records in other war zones; Dakar, Tunis, Casa Blanca and London. They have long lasting quality that more than amply fits them for any peace-time need.

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**WELL WATER SYSTEMS  
DEEP WELL PUMPS**

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Requiring 10% Less Steel to Manufacture

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Manufactured to A. R. E. A. Specifications

Furnished in Double or Single Shoulder

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Will Eliminate Such Worries Permanently!**

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*Established in 1922*

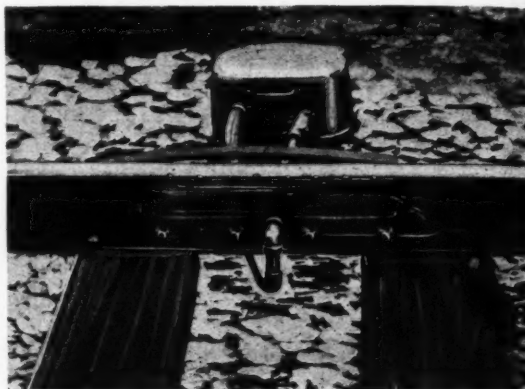
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**Ardco Automatic Rail and Flange Lubricator**

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The "Sesmo" type is similarly effective. This lubricator, however, is actuated by rail wave motion and is not dependent upon wheel impact.

Both "Ardco" and "Sesmo" lubricators greatly prolong the life of curve rails—tire turning is minimized—curve resistance is reduced—safety is increased—and steel is saved!

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**Sesmo Automatic Rail and Flange Lubricator**

**Railway Engineering and Maintenance**

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Above: An Industrial Brownhoist 40-ton Diesel locomotive crane at a Great Lakes yard easily swings an army boat to flat car after trial run. The patented Monitor-type cab provides 360° visibility, increases operator efficiency. Left: A 10-15 ton capacity I.B. fast plant for unloading iron ore from lake boats. Moveable lorry rides on runway, weighs ore and delivers it to railroad cars under span. Write for further facts about Industrial Brownhoist equipment to solve your material handling problems.

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Switch Points  
And Save  
Labor  
of Renewals

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At this time, more than ever, they will show large savings in extending the life of switch points and stock rails, also will prevent derailments on switches caused by sharp wheel flanges climbing on worn points.

*Order now to help keep your  
traffic moving without delays*

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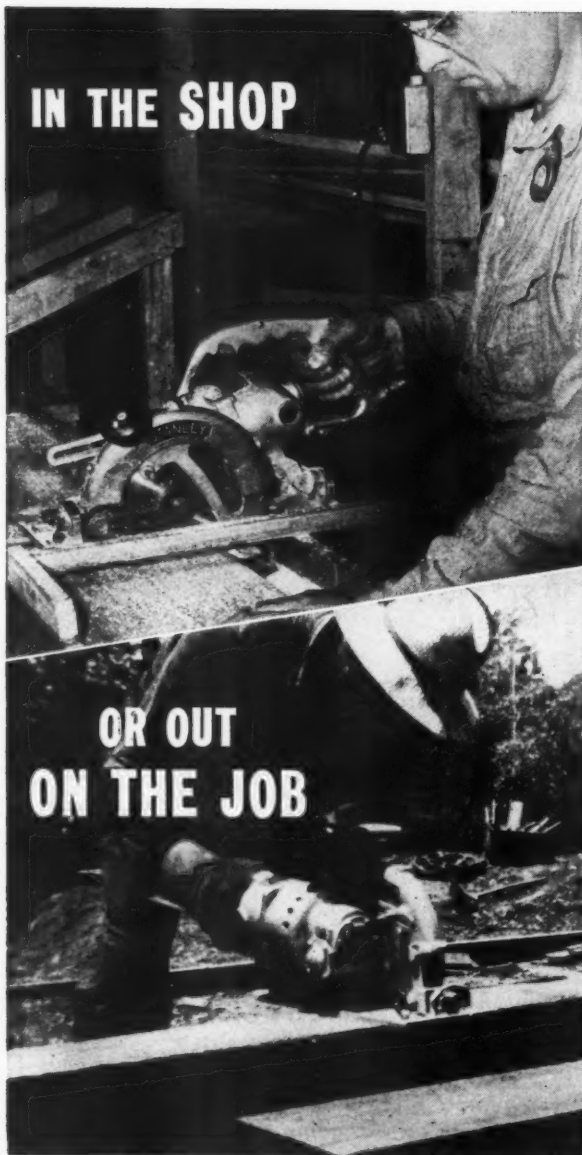
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**OR OUT  
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For repair work in the shop, or cut-to-fit construction out on the job, a Stanley Portable Electric Saw will save ninety per cent of the time required for hand sawing . . . and quickly repay its cost.

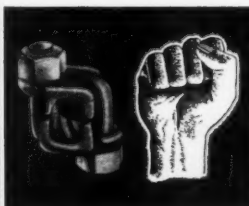
Easily and safely handled, light yet powerful, Stanley Portable Electric Saws are available in various sizes, may be equipped with all standard wood-cutting blades, as well as those for metal, tile or stone cutting. Write for complete information. Stanley Electric Tool Division, The Stanley Works, New Britain, Conn.

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THIS SAFETY CLIP  
HOLDS WIRE ROPE  
WITH A  
**"FIST-GRIP"**



Four flat bearing surfaces grip rope without weakening or distorting it.

Rope ends stay straight, full strength, ready for use again.

THIS ORDINARY CLIP  
HOLDS WIRE ROPE WITH A  
**"FINGER-PINCH"**



Rope is crushed and bowed. Rope end is weakened and should be cut off for future jobs when clips are removed.

Strain is distributed unevenly on bowed rope when under tension.

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**Does the  
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WHEN AND WHERE YOU  
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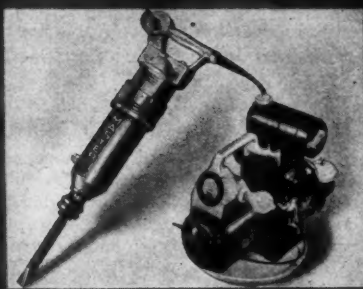
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**USE MASTER GAS-ELECTRIC  
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Save time . . . last longer

**A**vailable with tools for drilling, cutting or spading. Will do light duty work or any heavy duty work. The Master Hammer runs without striking a blow until pressure is applied, enabling operator to control blow as job requires. Easy and economical to operate. Built for light weight and long service. Used throughout the world. Power blow hammers operate on 115 volt AC or DC, 25, 50, or 60 cycle. If no electricity is available use Master Portable Generator Plant Model 650 (illustrated above).

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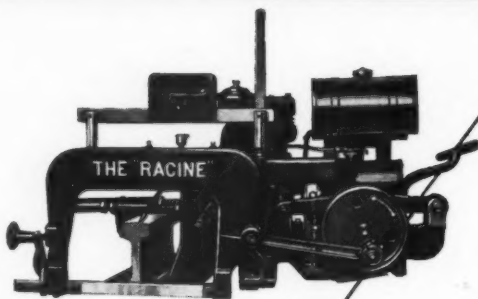
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 accurately**

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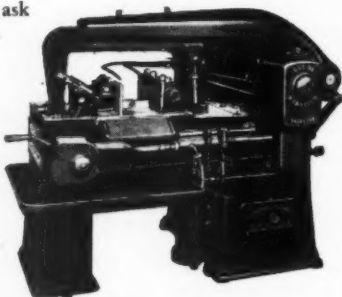
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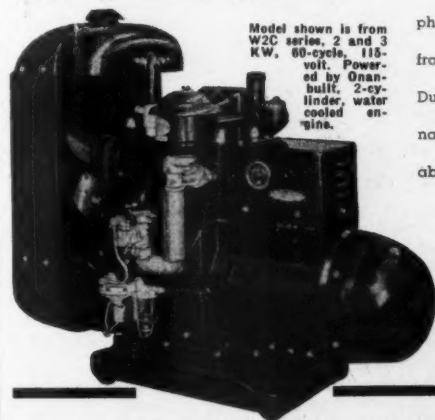
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1½ to 25 GPM—54 Models.

Write for Bulletin 304—

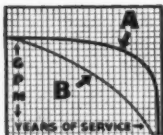
FACTS ABOUT ROTARY PUMPS

**Blackmer Pump Company**

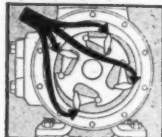
2140 Century Ave.

Grand Rapids 9, Mich.

**BLACKMER ROTARIES**  
POWER PUMPS · HAND PUMPS



A—Blackmer pump capacity. Note the long sustained efficiency. B—Conventional Rotary Pump capacity.



Wear is confined to the tips of the buckets, which automatically compensate for wear.

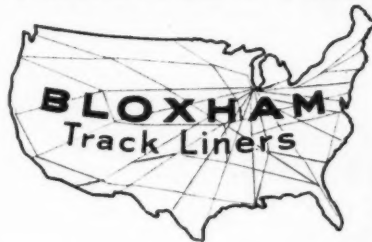


This much can wear away, without affecting the capacity of the pump.



When worn out, replace the buckets and the pump is restored to normal efficiency.

## The No. 1 Choice of America's Railroads



### Because:

They insure faster rail aligning with fewer men.

They are ruggedly built and easy to operate.

They permit just a straight pull on the rail—no lifting or stooping.

They have a double notched fulcrum which eliminates "heeling up."

Write for  
details and  
prices



**CHICAGO STEEL FOUNDRY COMPANY**

3701 S. KEDZIE AVE., CHICAGO 32, ILLINOIS

## LUFKIN "METALLIC" WOVEN TAPE



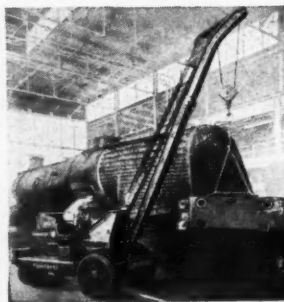
The Lufkin Metallic is the best of woven tapes. Coated line with metallic warp resists wear, moisture, stretching and fraying. Large, clear markings make it easy to read. When equipped with folding hook ring, measurements can be easily taken unassisted.

See it at your dealer and write for free catalog.

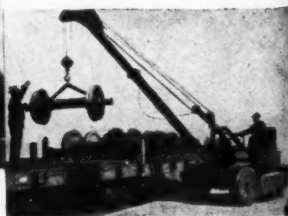
**LUFKIN**

SAGINAW, MICHIGAN · NEW YORK CITY  
TAPES · RULES · PRECISION TOOLS

## HOW TO HANDLE REPAIRS



*Faster*



### KRANE KAR

Mobile Swing Boom Crane

Handle the load *ONCE!* KRANE KAR lifts, transports, and positions it. No need to maneuver the vehicle—swing the "live" boom from side to side and up or down, by power, with full load on the hook. Stable without jacks or outriggers; automatic load and boom braking; safe and easy to operate. Speeds up railway maintenance construction and repairs.

USERS: NY Central; B & O; C B & Q; Western Pacific; Pennsylvania; Canadian Pacific; C & O; D & H; Missouri-Pacific; Great Northern, etc.

Agents in the Principal Cities



THE ORIGINAL SWING BOOM MOBILE CRANE  
WITH FRONT-WHEEL DRIVE AND REAR-WHEEL STEER

**KRANE KAR**  
FOR RAILROADS

SILENT HOIST & CRANE CO., 868 63RD ST., BROOKLYN 20, N.Y.

## DIAMOND-BORED RODS

another  
"HIDDEN VALUE"  
in all  
**WISCONSIN**  
*Air-Cooled*  
**ENGINES**



Absolute uniformity and close-tolerance fit of all connecting rod bushings are direct results of the unique machine operation illustrated above. Each rod is rigidly locked in precisely the same position, and diamond-pointed bits machine both ends of every rod with uncanny smoothness and perfect mechanical precision. All of this helps to produce a quiet, smooth-running engine, designed and built for heavy-duty service all the way through.

All of this adds up to highly satisfactory end use on your equipment.

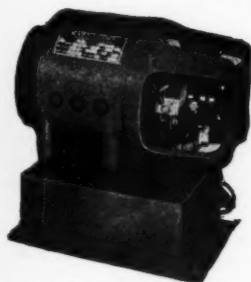
Most  
H.P. per  
pound



**WISCONSIN MOTOR**  
Corporation  
MILWAUKEE 14, WISCONSIN, U. S. A.  
World's Largest Builders of Heavy-Duty Air-Cooled Engines

## 110-VOLTS A.C. from DIRECT CURRENT

with KATOLIGHT ROTARY KONVERTERS for operating radio and electronic equipment, moving picture projectors, sound apparatus, A.C. appliances, etc.



225-watt Converter

Available in sizes 110 through 2500 watts, 1800 and 3600 r.p.m. ball bearing designs. Furnish standard 110-volt 60 cycle A.C. from 32, 110 or 220-volts direct current. Quiet in operation. Can be furnished with special filtering equipment for sensitive radio work.

### PIONEERS IN THE BUILDING OF SMALL ROTARY CONVERTERS

At present Kato's entire production must be directed to furnishing converters on high priority orders. Write us if you need this kind of equipment for orders.

Also manufacturers of A.C. and D.C. generators ranging from 350 watts through 25 K.W., power plants, frequency changers, high frequency generators, and motor generator sets.

**KATO ENGINEERING COMPANY**  
301 Spring St. Mankato, Minn.

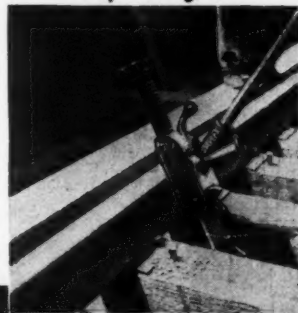
Railway Engineering and Maintenance

## Ties Close Together?

### Use the No. 310 Simplex Jack!

Simplex No. 310, 15-ton capacity. Height, 22 1/4". 13" lift. Base, 3 7/8" wide; 10 3/4" long.

MEMBER



On bridges, trestles, viaducts—wherever ties are closely spaced to compensate for absence of ballast—the No. 310 saves time on lining and surfacing of track. Tilts on base. Chain—standard equipment—has bolt-pulling end link.

Templeton, Kenly & Co.  
Chicago (44), Ill.

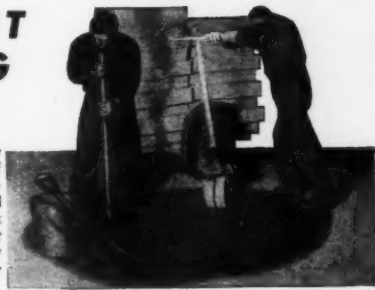
Cutting Railroad Operating Costs Since 1899

**Simplex**  
LEVER - SCREW - HYDRAULIC  
**Jacks**

## PATCH FLOORS

### WITHOUT HALTING TRAFFIC

No longer is it necessary to close off an area of concrete floor while waiting for newly installed patches to set. Flexrock offers a new plastic repair material which is ready for traffic almost the moment it's put down.



### Tamp Smooth! Truck Over Immediately!



There is no waiting. Simply shovel INSTANT-USE into the hole or rut—tamp—and your floor is restored to solid smoothness . . . back in service without delay. Tough INSTANT-USE bonds tight to old concrete, makes long-lasting heavy duty patch. Withstands extreme loads. Keep a drum on hand for emergencies. Immediate shipment.

REQUEST DESCRIPTIVE FOLDER and Details of FREE TRIAL OFFER

## INSTANT-USE

**FLEXROCK COMPANY**

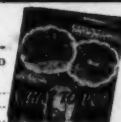
3647 Filbert St., Philadelphia 4, Pa.

Please send me complete INSTANT-USE information and details of FREE TRIAL OFFER—no obligation.

Name .....

Company .....

Address .....







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# IMPROVED HIPOWERS

## IMPROVE TRACK

On curves and tangent track,  
IMPROVED HIPOWER SPRING WASHERS  
are doing the important job  
of maintaining bolt tensions.

**THE NATIONAL LOCK WASHER COMPANY, NEWARK, N. J., U. S. A.**  
**A COMPLETE LINE OF RAILWAY SPRING WASHERS**

# Compression Rail Anchors



For Economical Two-Way  
Holding of The Rail  
Where it is Most Needed

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